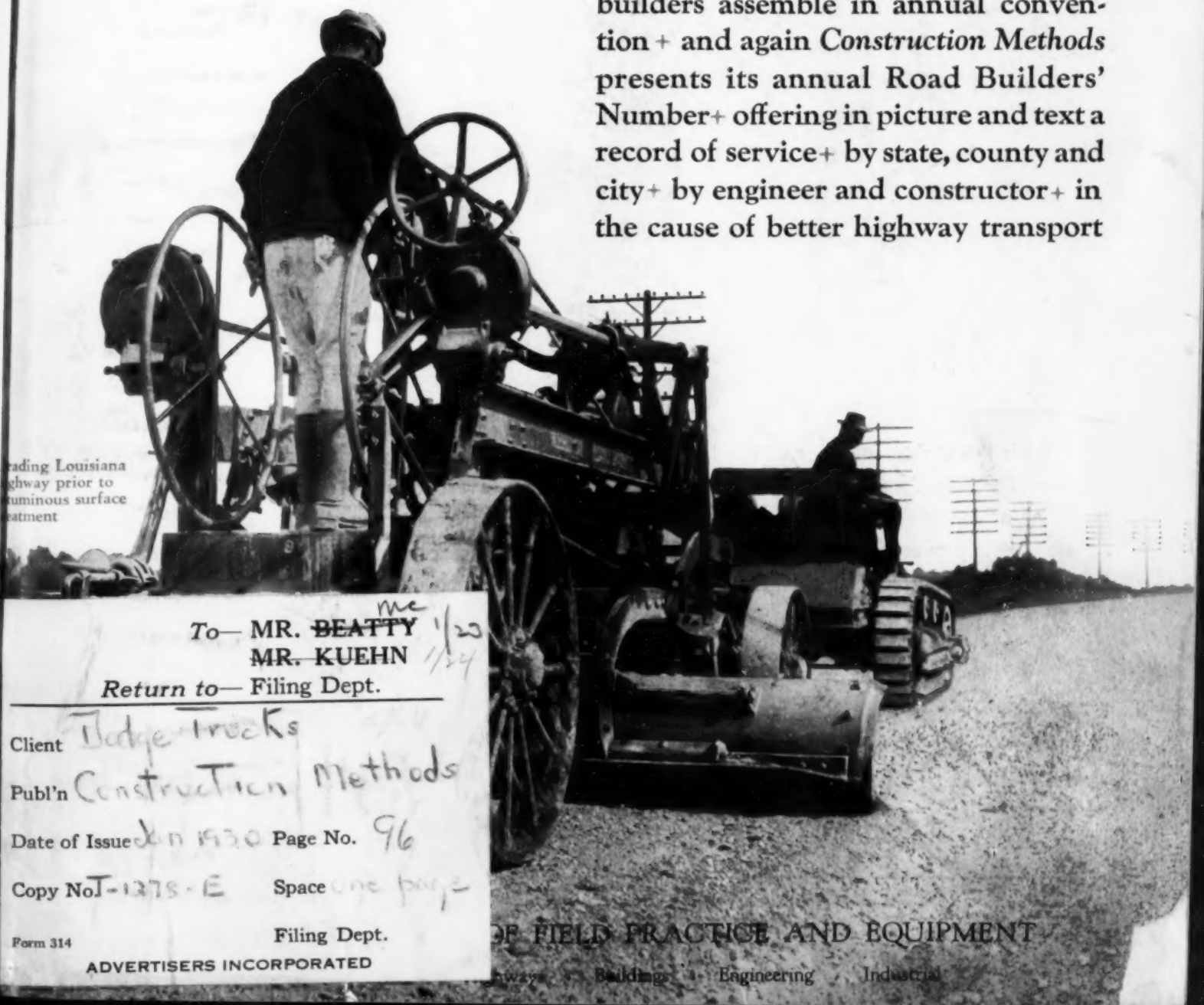


Construction Methods

ROAD BUILDERS' NUMBER

Again this month the nation's road builders assemble in annual convention + and again *Construction Methods* presents its annual Road Builders' Number+ offering in picture and text a record of service+ by state, county and city+ by engineer and constructor+ in the cause of better highway transport

grading Louisiana
highway prior to
luminous surface
treatment



To— MR. BEATTY ^{me} 1/20
MR. KUEHN 1/24

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Dodge Trucks

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Construction Methods

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96

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ADVERTISERS INCORPORATED

OF FIELD PRACTICE AND EQUIPMENT

Highways • Buildings • Engineering • Industrial

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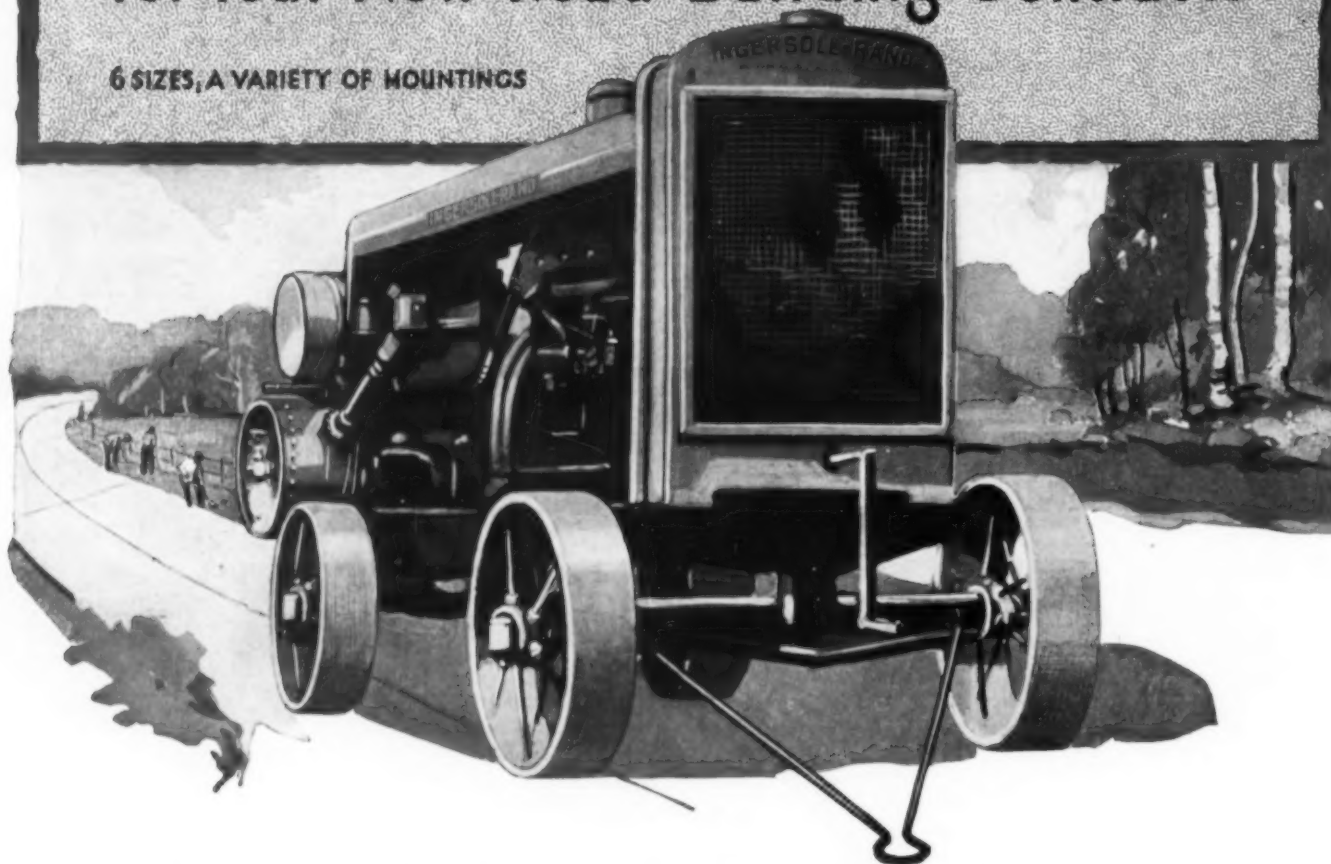
1930



1930

A New Year-New Problems-New Equipment
and
A GREAT LINE of PORTABLE COMPRESSORS
for Your New Road-Building Contracts

6 SIZES, A VARIETY OF MOUNTINGS



1930 is the eighteenth year of the Ingersoll-Rand Portable Compressor. Though never offered in "yearly models," these units have been steadily improved, and today they are recognized as the outstanding machines in their field.

Six sizes of Portable Compressors—the best we have ever offered—are ready for work on your new contracts. An I-R service engineer will gladly help you select the machines best suited to your requirements.

INGERSOLL-RAND COMPANY • 11 Broadway • New York City

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235-PC

Ingersoll-Rand

CONSTRUCTION METHODS, January, 1930, Vol. 12, No. 1. Published monthly. McGraw-Hill Publishing Company, Inc., Tenth Avenue at Thirty-sixth Street, New York, N. Y. Two years for \$1; per copy, 5 cents. Entered as second-class matter, October, 1926 issue. Vol. 8, No. 19, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

TECHNOLOGY DEPT.

January, 1930—CONSTRUCTION METHODS

The Editor Notes --



On to the Road Show!

AS THIS, the annual Road Builders' Number of *Construction Methods* goes to press, plans have been completed for the greatest highway conference and equipment exhibit ever held in the United States—the twenty-seventh annual convention and show of the American Road Builders' Association at Atlantic City, N. J., Jan. 13-18. In its technical program, in its display of the latest developments in road-building machinery and materials and in its opportunities for personal contacts, the convention offers to highway engineer and contractor an educational service limited only by their capacity to hear and to assimilate what current practice offers for better road building.

—And while you're at the show remember that a welcome awaits you at *Construction Methods'* booth, occupying space No. 145 just inside the main floor entrance of the Convention Hall. Our telephone and messenger service, which has proved to be a real convenience in years past, will be at your disposal throughout the week.

One Explanation

Why some construction accidents occur, according to George Widua, of Woods Bros. Construction Co.: "The human brain is a wonderful organ. It starts working the moment we get up in the morning and doesn't stop until we get to the job."

Why Progress Was Rapid

CONSISTENTLY rapid progress, week after week, is recorded in the description, on pp. 72-75, of the concrete paving work done in Illinois by J. C. O'Connor & Sons, Inc., who laid 21.3 miles of 9-6-9-in. slab 18 ft. wide with a 1-yd. mixer outfit in less than five months. In the flashy, single-day record there is no significance. The maintenance of sustained speed is what really counts. Particular interest, therefore, attaches

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, Editor

Editorial Staff

VINCENT B. SMITH NELLE FITZGERALD
J. I. BALLARD (San Francisco)

WILLARD CHEVALIER, Publishing Director

A McGraw-Hill Publication

Tenth Avenue at 36th Street, New York

Construction Methods was founded in 1919, under the name *Successful Methods*, by the Manufacturers Publicity Bureau, Inc., of Chicago, representing a group of non-competing manufacturers of construction equipment. Charles R. Thomas, editor of the first few issues, was succeeded by William Jabine.

In 1926 the McGraw-Hill Publishing Company, Inc., of New York, purchased the publication, changing its name to *Successful Construction Methods* in November of that year and to *Construction Methods* in May, 1927.

Robert K. Tomlin was appointed editor of *Construction Methods* in January, 1928. Vincent B. Smith and J. I. Ballard (San Francisco) are assistant editors and Nelle Fitzgerald editorial assistant.

to the following observations on the job made by C. M. Hathaway, engineer of construction for the Illinois Division of Highways: "The O'Connors started out with an adequate grading outfit and at all times kept the rough grading well ahead of the work so that it could not possibly hold up paving operations.

"The second feature was preparation of the subgrade and the setting of forms far enough in advance of mixing operations to prevent delay in the placing of the pavement. The third item was the handling of materials from the plant site to the job—a well-planned plant for unloading from railroad cars, storing and loading materials from the batchers with industrial cars. Adequate motive power kept loaded batch boxes at the mixer at all times. The contractor appreciated that it was highly important that there be absolutely no lost time at the mixer waiting for materials. A brand new up-to-date paver kept output at a maximum, and a well developed organization worked long hours within daylight limits."

In other words, records of this sort don't just happen. Back of them is found good men, adequate equipment, planning and job co-ordination.

No Underbidding Here!

CONTRASTING with the excessively low bids for road building about which most contractors are complaining this season is one submitted recently in the California state highway department. For grading and paving a 9-mile section in Alameda County one contractor startled the state officials by submitting a price of \$170,151,298.25, which figures out to about nineteen million dollars per mile, an all-time high figure for road construction. The joker in the case was the contractor's error in placing his figure for the total cost of one item in the unit price column. As submitted, his bid for unclassified excavation was \$8,240 per cubic yard.

P.S. He didn't get the job.

To Test Welds

Some engineers have objected to welding because it requires a destructive test to pass inspection. It has recently been demonstrated that a non-destructive test can be made by means of a stethoscope which will detect a weld that is more than 5 per cent defective. The procedure consists in applying the stethoscope equipped with a soft rubber addition to the parent metal and tapping the welded seam with a light hammer. The sound from defective work is so different from that of good welds that little experience is necessary in locating the defects.

Creative Spending

In advocating the principle of *creative spending* rather than of pinching economy, Charles F. Abbott, executive director of the American Institute of Steel Construction, says that Cyrus Curtis, head of the great publishing organization that bears his name, had an executive in his employ whom he had to discharge because he could never teach the man to spend enough money. The executive had been trained in the old school of saving.

A Market Place Plus

SPEAKING recently to a meeting of business paper editors, Samuel O. Dunn, Editor of *Railway Age*, set forth clearly and succinctly a fact too often forgotten.

"There is nothing so effective in bringing to an end the use of obsolete machinery or methods," said Mr. Dunn, "as the widespread dissemination of information regarding improved machinery and methods.

"When I mention the contribution the business press has made toward the progress of industry and commerce, I include the contribution that has been made by what has been published in its advertising as well as in its editorial columns. We editors cannot claim all the credit for the contributions that have been made by the business press toward business progress. The manufacturers who advertise their products, especially those

products that are new or in which improvements have been made, help to increase the demand and to enlarge the market for these commodities, and have surely made as real a contribution toward progress in our industry and commerce as have the editors who disseminate constructive information through the editorial columns."

Too often the reader is prone to regard the advertising section of the business paper as nothing more than a market place for the display of the manufacturers' wares. Market place it is, of course, and a very useful one; but above and beyond this bread-and-butter function, it is an essential element in the service offered by the paper toward the progress of the industry it serves.

The wise reader of *Construction Methods* studies its advertising and editorial pages with equal care, finding only in the combination of the two the full service the paper makes available to him for his progress and profit.

Willard Chevalier
Publishing Director.

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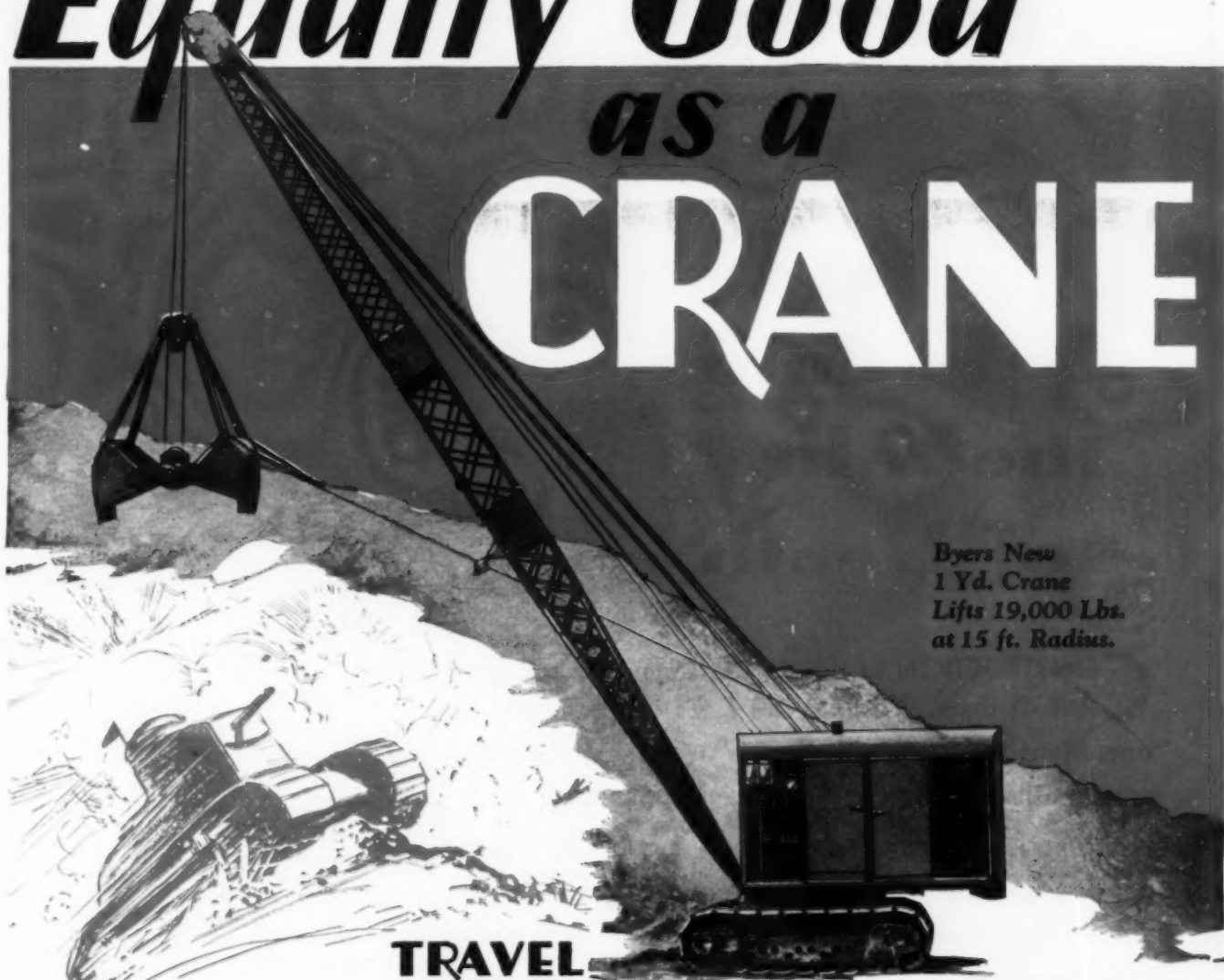
SAN FRANCISCO, 883 Mission Street

LOS ANGELES, 632 Chamber of Commerce Bldg.

LONDON, 6 Bouverie Street, London, E. C. 4

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Equally Good as a CRANE



Byers New
1 Yd. Crane
Lifts 19,000 Lbs.
at 15 ft. Radius.

Maneuvers Easily—

Just like army tanks were built with ample stability to travel over the shell holes of French Battlefields—

So are Byers cranes built with ample stability to travel over the rough ground of construction jobs. Long, wide crawlers and extra under-axle clearance help Byers cranes to get around, to travel safely with heavy loads suspended, to maneuver easily in close quarters.

**TRAVEL
STEER ... all at the same time
HOIST
SWING**

THAT'S what you want in a crane! Stability, too, is found in Byers long, wide chain driven crawlers with self cleaning treads and plenty of clearance under the axles for rough ground travel.

High and low travel speeds! Long booms handle heaviest loads easily with plenty of reserve power from oversize motors.

Simplified operation! Economical operation! Profitable operation! Long life!—all Byers cranes are improved 1930 models, a long step ahead in design.

Write for Crane Catalog.

THE BYERS MACHINE COMPANY, Ravenna, Ohio

Byers ½ yd. full circle Bulldog Shovel, Crane, Dragline, Trencher, Skimmer

Byers ¾ yd. full circle Shovel, Crane, Dragline, Trencher, Skimmer

Byers 1 yd. full circle Shovel, Crane, Dragline, Trencher

Byers 1¼ yd. full circle Master Shovel, Crane, Dragline

Byers ½ yd. half circle Bear Cat Shovel, Crane, Trencher, Skimmer

SALES AND SERVICE THROUGHOUT THE COUNTRY

BYERS SHOVELS AND CRANES

Excavations for train rights of way into the new Terminal Tower at Cleveland called for fast work in congested business districts. Wise contractors called for Autocars.

Into the Valley of Death



CONSTRUCTION to the right of them. Construction to the left of them. Yet into this maze of congested building operations the short wheelbase Autocars speed with all the courage that immortalized The Light Brigade.

No ramp is too steep to prevent their pulling out with full pay-loads. Few are the places under the chin of a shovel where they cannot turn in a jiffy with their 114-inch wheelbases.

Contractors who bank their reputations on completing contracts on scheduled time, buy the famous 6-cylinder Autocar Trail Blazers, because these trucks can do more work more quickly in less space than any other truck that is made.

To this exclusive Autocar advantage is added a factor of dependability insured by the precision standards to which these trucks are built. » » » The engine-under-the-seat Trail Blazer is duplicated in conventional design with wheelbases from 157' to 203' for work in less congested quarters.



Who uses them?
How? Why? The
Autocar Construction
Book will tell you all
this — and more.
Write for a free copy.

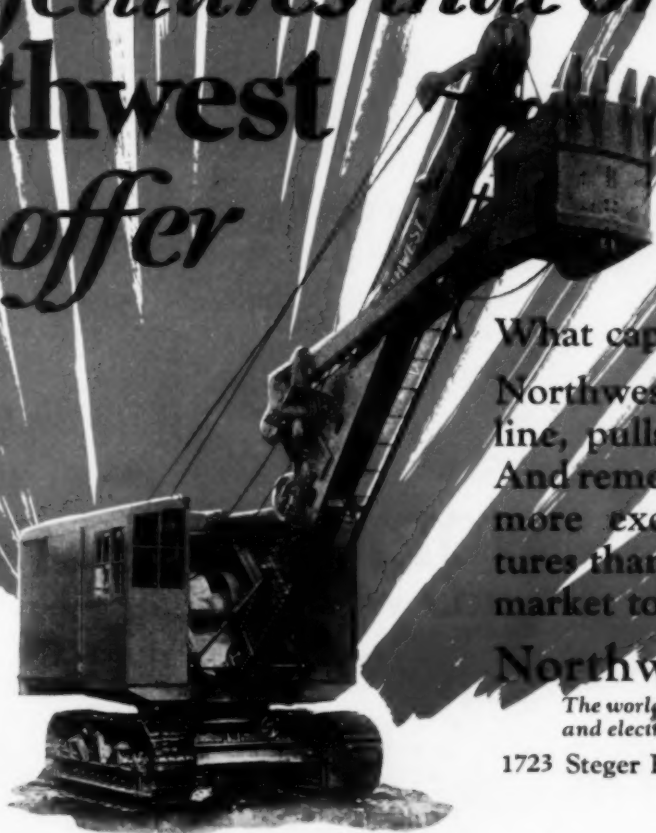


AUTOCAR TRUCKS

The AUTOCAR Company, Ardmore, Pa., Established 1897



$1\frac{1}{2}$ to $1\frac{1}{2}$ cu. yd.
with features that only
Northwest
can offer



What capacity do you need?

Northwest has it—shovel, crane, dragline, pullshovel or skimmer-scoop. And remember, Northwest offers you more exclusive money-making features than any other machine on the market today!

Northwest Engineering Co.

The world's largest exclusive builders of gasoline and electric power shovels, cranes and draglines

1723 Steger Building 28 East Jackson Blvd.
 Chicago, Ill., U. S. A.

CM 1-Gray

NORTHWEST

**THE BEST BUY
 ON THE MARKET
 TODAY ♦ ♦ ♦**

PAGE

CLYDE

HOISTS - DERRICKS

used by thousands

For all kinds of work - all over the world - there are thousands of Clyde hoists being used by satisfied owners. Built for performance and service, they justify the highest expectations of the most critical operator. Below is shown a gas tank being built at Duluth, by the Stacey Mfg. Co. Three Clyde hoists are working on this job - a two drum gas hoist operates the derrick in the background - a two drum steam operates the traveling crane - and a two drum electric operates the riveter.



CLYDE IRON WORKS SALES CO.

DISTRIBUTORS FOR CLYDE IRON WORKS DULUTH, MINNESOTA

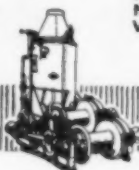
—BRANCHES—

NEW ORLEANS: 309 MAGAZINE ST.
 PORTLAND, OREGON: 555 THURMAN ST.
 SEATTLE: 3410 FIRST AVENUE SOUTH
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 1325 STANDARD BANK BLDG.



TWO MARKS OF



GUARANTEED QUALITY





LAKWOOD TYPE C FINISHER
WITH TANDEM SCREED ATTACHMENT

THE LAKEWOOD ENGINEERING CO.

CLEVELAND, OHIO

FOR

1930

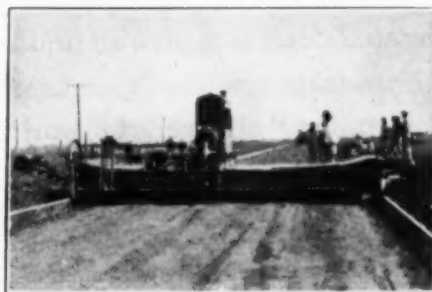
THE LAKEWOOD TANDEM SCREED ATTACHMENT

Adaptable to All Lakewood Type C Screeds, and adding still more to the flexibility of this machine by making available to present as well as future owners, their choice of Single Screed, Tandem Screed, or Combined Screed and Tamper operation.

THE LAKEWOOD POWER SUBGRADER

Applies power in a simple, practical way to fine grading. Insures correct thickness and cross section of slab at all points. Insures against over-run of material. Mills the grade to depth and crown, and deposits excess material outside the forms.

To be Exhibited with other
Lakewood Paving Equipment
Space 229, Atlantic City Audi-
torium, January 11-18, 1930
Literature available on request.



THE LAKEWOOD POWER SUBGRADER
CUTTING 3 INCHES OF TEXAS 'DOBE



Old-Timers Are the Best Salesmen

Never mind battered canopy or spattered mud—these are eloquent of tractor performance under the worst conditions of ground and weather! It is true that pictures of veteran "Caterpillar" Tractors have greater sales value than a view of the latest, newest shiny machine right out of the factory. For contractors and earth-movers and road-builders buy "Caterpillars" for traction and power—not paint or prettiness. And dented tanks and bent mudguards and scarred paint are but wound stripes won in action! For in "Caterpillar" track-type Tractors wide, firm-gripping tracks and sturdy engine are so built from heat-treated steels as to give an unusually long and *dependable* service. Thousands of veteran "Caterpillars" all over the world are proving this!

Photo shows a "Caterpillar" Sixty owned by the Arundel Corporation, hauling a steam shovel boom on the Saluda Dam job, near Columbia, South Carolina, U. S. A.

Prices—f. o. b. Peoria, Illinois

TEN	\$1100	TWENTY	\$1900
FIFTEEN	\$1450	THIRTY	\$2375
SIXTY	\$4175		

Caterpillar Tractor Co.

PEORIA, ILLINOIS and SAN LEANDRO, CALIF., U. S. A.
Track-type Tractors / Combines / Road Machinery

(There is a "Caterpillar" Dealer Near You)

CATERPILLAR
REG. U. S. PAT. OFF.
T R A C T O R

THE GREATEST SINGLE SOURCE OF FACTS ON DIESEL EXCAVATORS



SEE US AT THE ROAD SHOW
SPACE 214



Power shovels, clamshells, cranes, drag-
lines, dragshovels — $\frac{1}{2}$ to 16-yard ca-
pacity—electric, steam, gasoline, Diesel,
gas + air, Diesel + air.

Dipper hydraulic and placer mining
dredges.

A-21-1-30-C-M



Hundreds of Diesel excavating machines have been built by Bucyrus-Erie. Pioneering —building the first Diesel shovel—then producing the majority of the Diesel excavators, this organization has had the opportunity to find out what good Diesels can do.

We have studied the operation of Diesel excavators under conditions of hardest digging. We have checked production and compared fuel costs on a wide range of jobs. We have gathered facts and figures from the experience of users all over the world.

Here is a library of authoritative information on Diesel excavators. Headquarters for facts on Diesel, Diesel-Electric, Diesel + Air excavating machines of outstanding performance.

*Write for information. Ask any questions
you wish. We are always glad to co-operate.*

BUCYRUS-ERIE COMPANY

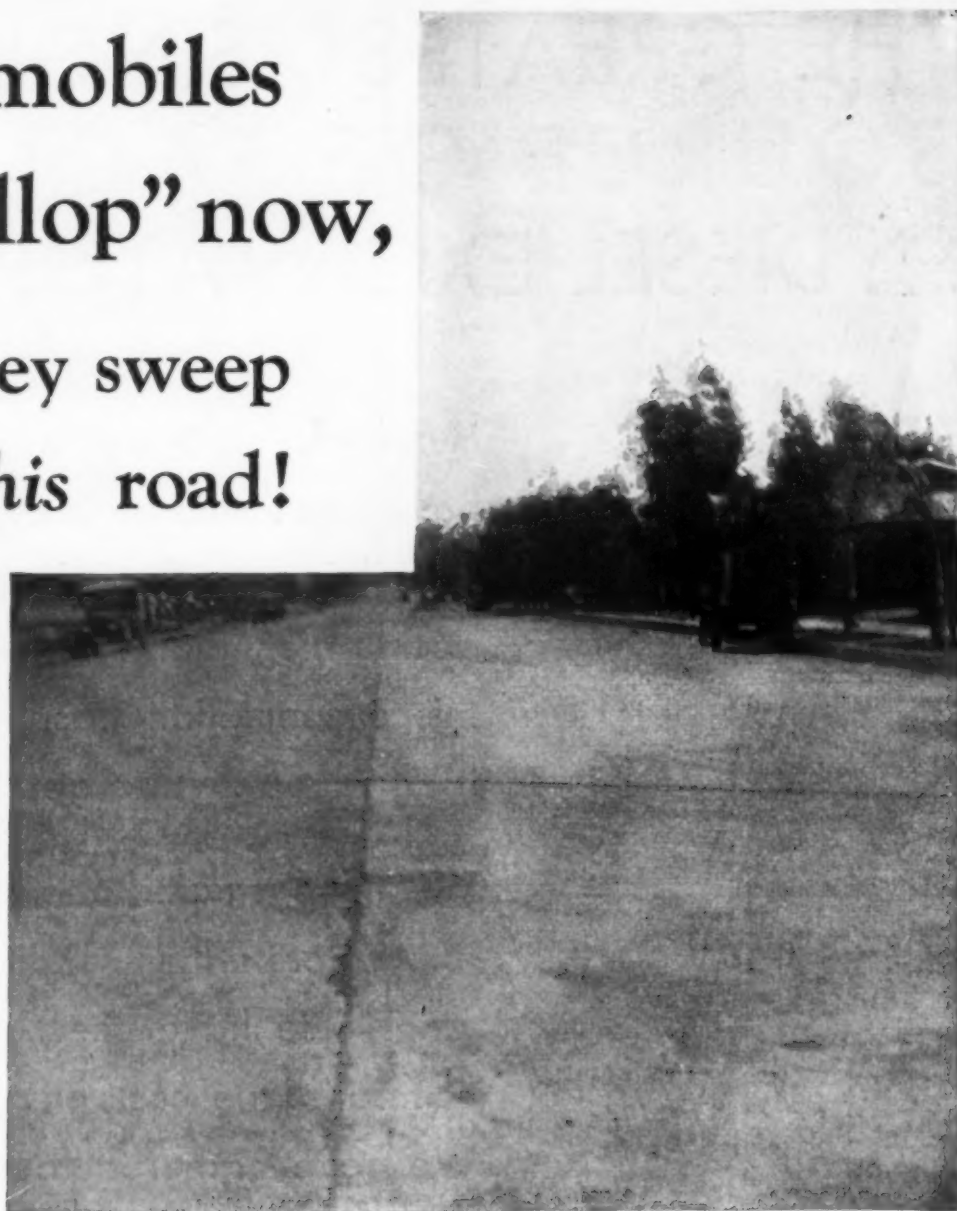
Plants: South Milwaukee, Wis., Erie, Pa., Evansville, Ind.

General Offices: South Milwaukee, Wis.

Branch Offices: Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco.

Representatives throughout the U. S. A. Offices or distributors in all principal countries.

Automobiles
don't "gallop" now,
...as they sweep
along *this* road!



Showing the installation of Carey Elastite Expansion Joint, on Hadley Avenue, Whittier, California—placed at regular intervals, to prevent chipping and spalling, to keep the concrete surface smooth.

IT'S crossed longitudinally and transversely with *Elastite*, the pioneer Expansion Joint. Permanently buckle-proofed—smooth, the year around.

Carey Elastite Expansion Joint is made up in "sandwich" form—two tough strips of asphalt-saturated felt, with a filler of asphalt and fibre. Climate-proof—uniform in texture and consistency, at one hundred degrees or at zero. Economical. Used by municipalities everywhere in the construction of concrete roadways, bridges, dams and culverts. Indispensable; it protects the concrete lastingly against expansion and contraction strains. Have us send you particulars about Expansion Joint installation.

**Carey
Elastite**
EXPANSION
JOINT

THE PHILIP CAREY COMPANY, Lockland, CINCINNATI, OHIO

Why An Owen!

It has greater digging power
It digs down
It gets bigger bites
It penetrates deep and dumps clean
It is faster
It stays rigid
It stands up under hard service
It reduces cable costs
It is protected against breakage
It lasts longer
It costs less to operate

Read the 17 sound, logical reasons why—listed below. These are fully described and illustrated in Owen Folders on each of the four types of Owen Buckets; Type "M" Digger; Type "K" Hi-Speed; Type "D" Heavy Duty; Type "S" Rehandler. Write for a Folder on the type of bucket that interests you most.

THE OWEN BUCKET CO.
6023 Breakwater Ave., Cleveland, O.

Guarantee

Owen Buckets properly installed and operated, are guaranteed to do a bigger day's work than any other bucket of the same weight and capacity.

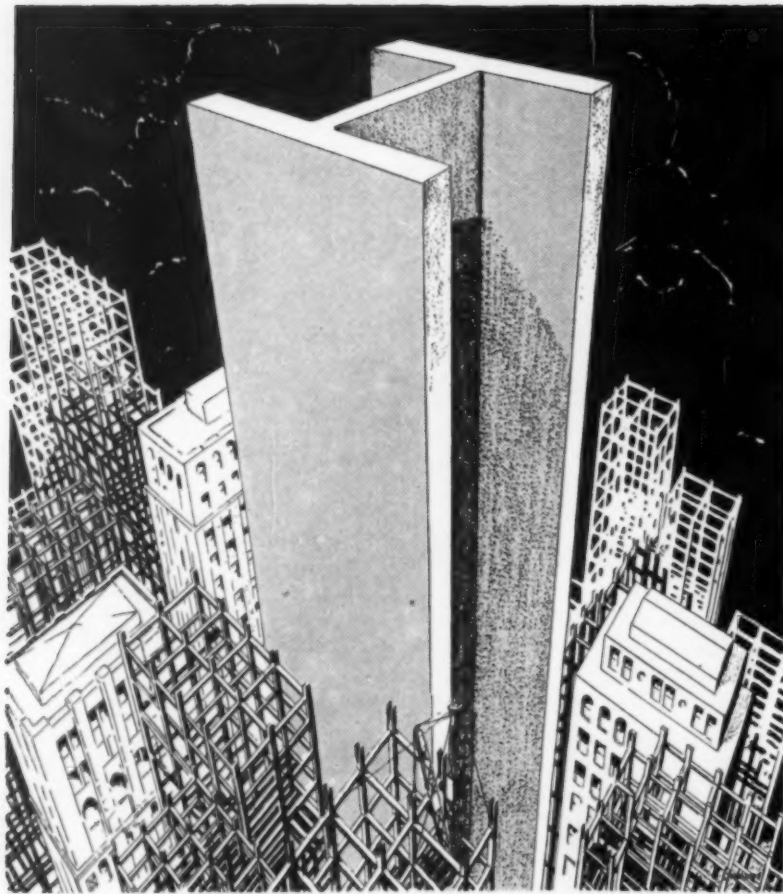
OWEN BUCKET CO.

17 POINTS OF LEADERSHIP

1. One-piece steel crosshead.
2. No wear in upper or lower arm ends.
3. Heavy high carbon steel arms.
4. Adjustable undiminished closing power.
5. Long life to sheaves and cable.
6. Long arm bolt bearings sealed from grit.
7. Lever type steel arm brackets.
8. Closing cable is protected against excessive wear.
9. Heavy shock-resisting renewable lips.
10. Cable clips eliminated.
11. Sealed center shaft bearings.
12. Greater digging power with no dead weight.
13. Penetration and clean dumping.
14. Dropping shocks absorbed, eliminating breakage.
15. Rigid shell construction.
16. Heavy duty high carbon drop-forged steel teeth.
17. Lips or teeth points hit first.



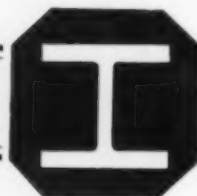
Owen Buckets



THE conspicuous success of Carnegie Beams indicates their remarkable adaptability to the needs of architects and designers. Carnegie Beams are distinguished by their wide parallel flanges which insure maximum strength in proportion to weight, and present unlimited possibilities in design and construction. Constant-depth columns, unique with Carnegie Beams, afford opportunities for duplication, both in design and erection. In any type of construction involving structural steel, Carnegie Beams offer economy, utility and flexibility of design never before possible. With the recent inclusion of a series of 33 and 36 inch sections, a still more efficient and complete selection of sections is now offered. They merit your investigation.

CARNEGIE BEAMS

CARNEGIE STEEL COMPANY
PITTSBURGH, PA.



Subsidiary of
United States Steel Corporation



"HERCULES"

RED-STRAND

WIRE ROPE

REG. U.S. PAT. OFF.

THE best recommendation for "HERCULES" (Red-Strand) Wire Rope is its service record.

—But there are good reasons why this wire rope is able to give such exceptional service, some of which are:

- (1) It is made of acid open-hearth steel wire.
- (2) Every wire put into this rope is first rigidly tested by us to make sure that it meets our exacting requirements.
- (3) It is the culmination of our more than 40 years of wire rope making experience.
- (4) It is made in both Round Strand and Patent Flattened Strand constructions in order to meet all working conditions.

Those who are using "HERCULES" (Red-Strand) Wire Rope find it safe, dependable and economical. Is not such service the kind that you want?

Made Only by **A. Leschen & Sons Rope Co.** Established 1857

5909 Kennerly Avenue

ST. LOUIS

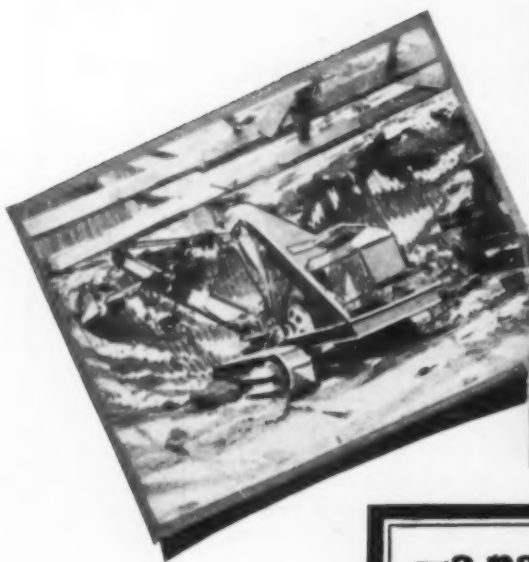
New York

Chicago

Denver

San Francisco

Distributors at over 100 different points. The name of our Distributor in any particular locality will be furnished gladly upon request.



—a page of BAY-CITY jobs

Each member of the "BAY-CITY Family of Fast Workers" is a convertible machine—use it as a Shovel, Trencher, Skimmer, Dragline, Crane or Backfiller.

On this page are illustrated some of the many uses the Tractor Shovel, Model K and the Model R are being put to by contractors all over the country—their work range is almost unlimited. They are rugged, sturdy, flexible, convertible machines, ready to tackle any and all work within their capacity. They are money-makers,—BAY-CITY users are BAY-CITY boosters.

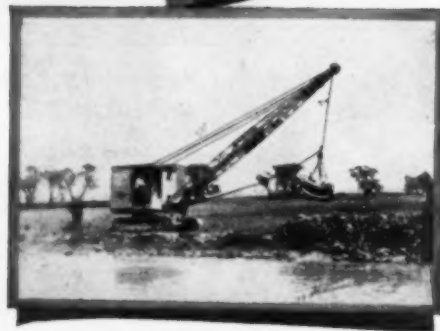
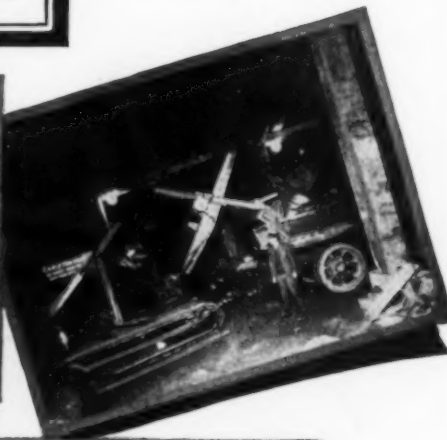
Write for literature—or see them at the Road Show, Atlantic City, January 13-18, 1930.

BOOTH No. 309

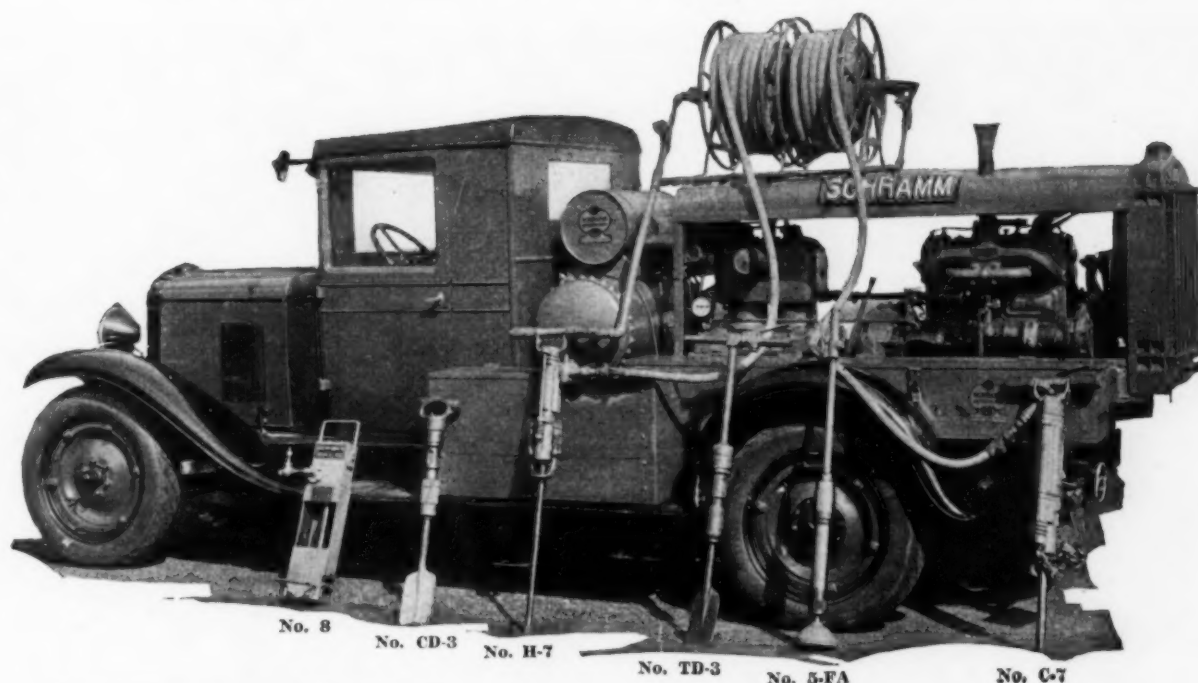
BAY CITY SHOVELS, INC.

New York Office:
302 Broadway

BAY CITY, MICH.



READY FOR ANY EMERGENCY



Schramm No. 120 Compressor
mounted on 1½-ton truck ready for operation

Tools shown:

No. 8 Sheet Pile Driver
No. CD-3 Clay Digger
No. H-7 Rotating Rock Drill
No. TD-3 Trench Digger

No. 5-FA Tamping Tool
No. C-7 Paving Breaker



Same Compressor with outfit and tools packed ready to move quickly to another job
and get busy as soon as it arrives on the scene of action.

Offices and Representatives in All Important Cities

Schramm Inc.

West Chester,
Penna., U.S.A.

..... "most Practical Roof for Long Span Construction"



Cross section of Mahon Steel Roof Deck showing interlocking principle and the application of insulation and roofing material. This deck can be insulated to any degree to meet your specific requirements.

MATERIAL

Mahon Steel Roof Deck Plates are rolled from special, tight-coated galvanized copper-bearing steel, and require no painting or maintenance whatsoever. The bright galvanized ceiling surface, presented by Mahon Deck installed, is a desirable asset from a standpoint of light reflection.

STEEL Roof Deck, due to its extreme light weight, is unquestionably the most practical roof for any building where long span trusses are employed. This type of roof construction is already being used almost exclusively by progressive architects for airplane hangars, field houses, riding halls, arenas, auditoriums, theatres, churches, industrial plants, and other types of buildings demanding long span construction. Basically, light weight is the outstanding advantage of Steel Deck construction . . . savings amounting to as much as 25% may be effected in the supporting steel alone. This, supplemented by the fire-

safety and permanence of steel, makes Mahon Steel Roof Deck a very desirable roof for any building. When considering Steel Roof Deck, investigate the superiority of Mahon design, the gauge and quality of material from which Mahon deck plates are rolled, and the principle of load distribution through lateral continuity. Write for our complete data book and our folder, "Facts and Figures".

THE R. C. MAHON COMPANY
DETROIT, MICHIGAN

*Branch offices in New York, Chicago and Pittsburgh—
Representatives in all principal cities.*

MAHON STEEL ROOF DECK

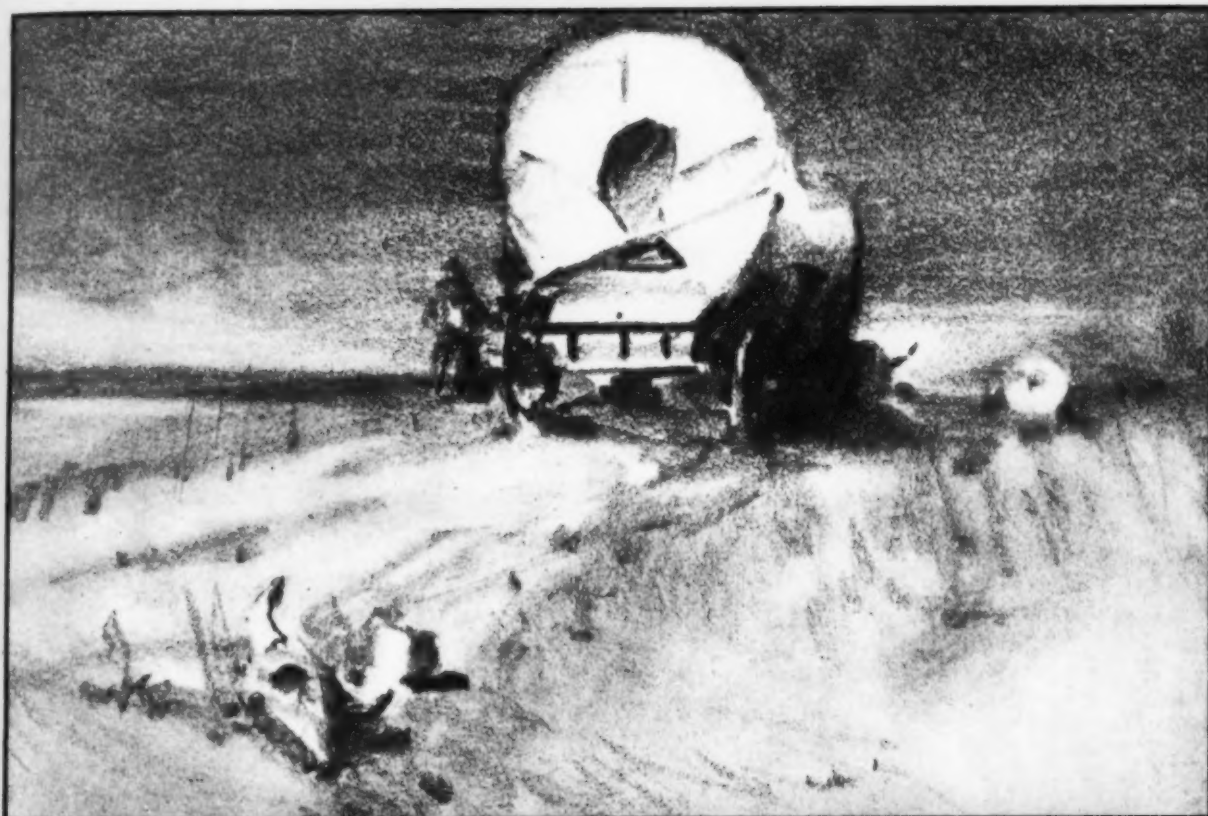
Manufactured in Galvanized Copper Bearing Steel in either 18 or 20 Gauge



Mahon Steel Roof Deck installed on the Tennis Arena at the Brookline Country Club, Brookline, Mass.

Garvin Haddin, C. E., designer

Since wagon roads were made from buffalo trails



From the age of the pioneer, when wagon roads were made from buffalo trails—an unbroken chain of service connects Austin-Western with modern progress—the age of the engineer!

The tradition of the Austin-Western Road Machinery of today has been growing steadily from a time when the threat of the Indian hung over blue forests and great rolling plains—before there were railroads west of the Missouri.

Over seventy years of close contact with the problems of building and maintaining roads that have changed the face of a continent have brought to Austin-Western engineers a rich

heritage of knowledge based on experience.

As the years go by, new materials and ripened experience combine to bring about improvements in both product and methods that are important to everyone concerned with building, using or paying for roads.

1930 finds Austin-Western ready with *the most complete line of road machinery ever offered to road builders!*

The Austin-Western organization is prepared to offer a continuation of the sort of service its many old friends in the road building field have learned to rely on through years of satisfactory dealings.

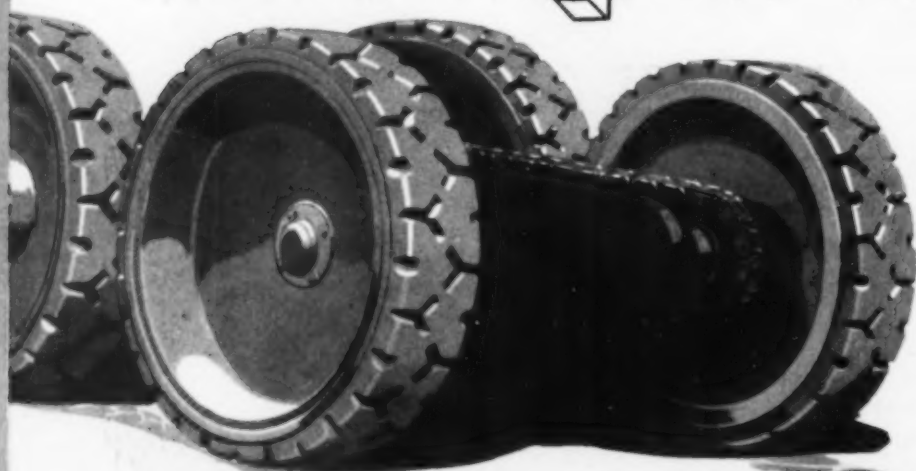
Austin-Western **ROAD MACHINERY**

DETROIT PUBLIC LIBRARY

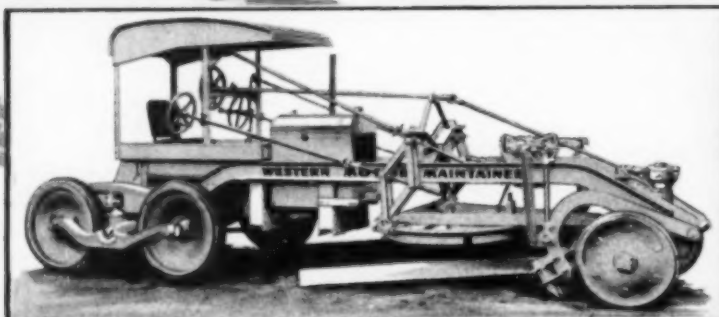
4-point

***driving
contact***

**over four widely
separated areas**



The new Western Motor Maintainer is a tandem drive motor grader for lighter work than the Austin 10-20 usually performs. It weighs 7000 lbs. and carries an 8-ft. blade.



Austin-Western

Dual Drive Motor Graders

supply more power at no increase in operating costs—greater tractive efficiency—freedom from skidding or miring—easier handling.

The Austin-Western Dual Drive principle of design provides four great drive wheels—two pairs in tandem. This increased driving contact over four widely separated areas gives greater tractive efficiency than it is possible to obtain with two-wheel or so-called "double-traction" drives.

Dual Drive Motor Graders always have sufficient traction to get through places that have hitherto caused graders to stall until dug out. With tractive effort applied over such a large area, there are still two or three drive wheels left on hard ground, even if one or two do run into soft or wet spots.

The forward drive wheel in each tandem presses down the softer ground and provides a solid footing for the rear drive wheels.

The tendency to side-slip or skid is checked in Dual Drive Motor Graders because, instead of one rear wheel to serve as the pivot for a skid, the Dual Drive opposes a base line several feet long between the points of contact of two drive wheels in tandem.

Because of these features a steadily increasing number of Dual Drive Motor Graders of varying weights and power are being used by public officials and contractors.



WRITE FOR COMPLETE INFORMATION

THE AUSTIN-WESTERN ROAD MACHINERY COMPANY

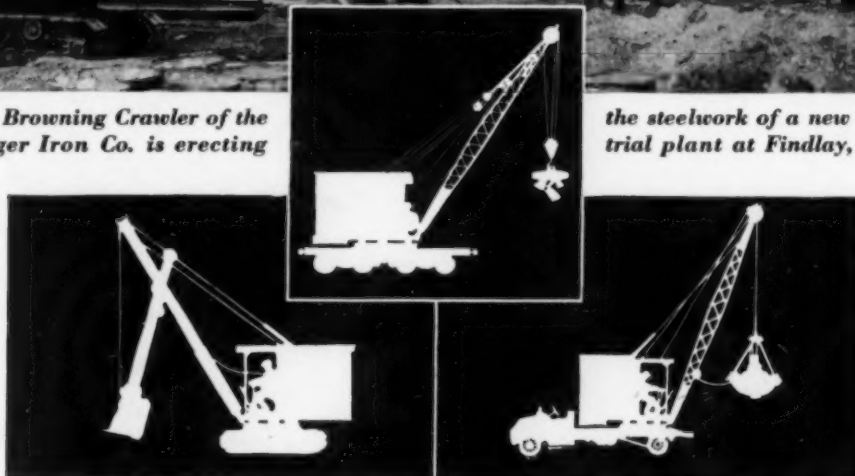
400 North Michigan Avenue, CHICAGO, ILLINOIS—Branches in principal cities

Leaning Wheel Graders, Straight Wheel Graders, Dual Drive Motor Graders, Elevating Graders, Crawler Dump Wagons, Scarifiers, Rock Crushers, Portable Conveyors, Rollers, Motor Sweepers, Street Sweepers, Sprinklers, Road Oilers, Hot Patch Portable Asphalt Plants, Plows and Scrapers



*This Browning Crawler of the
Burger Iron Co. is erecting*

*the steelwork of a new indus-
trial plant at Findlay, Ohio.*



Because of its speed, easy handling and flexibility, a Browning Crawler will turn out more productive work at a lower cost—whatever the job may be.

Let a Browning Crawler Crane solve your handling problems during 1930.

THE BROWNING CRANE COMPANY

16226 Waterloo Road

CLEVELAND, OHIO, U. S. A.

Branch Offices: NEW YORK, N. Y., CHICAGO, ILL.

DISTRIBUTORS

Portland	Los Angeles	New Orleans	Montreal	Toronto	Albany
Buffalo	Syracuse	Boston	Minneapolis	Birmingham	San Francisco
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St. Louis	Charlotte, N. C.	Baltimore	Atlanta	Tulsa, Okla.	

BROWNING

LOCOMOTIVE-TRUCK-CRAWLER CRANES

Here's an



CLETRAC Headquarters—AMBASSADOR HOTEL
ATLANTIC CITY

To you who will
attend the 1930
Road Show:

For a number of years
The Cleveland Tractor Company has enjoyed the
privilege of being host to hundreds of its Road
Builder and Contractor friends at the annual Con-
vention and Road Show of the American Road
Builders Association.

Again this year we invite you to use the
facilities and convenience of our hotel headquar-
ters and also our booth in the Auditorium at
Atlantic City. Arrangements have been made for
your comfort and enjoyment. We extend a hearty
invitation to COME IN AND SEE US.

Yours cordially,

W. J. Fleming
Vice-President

THE CLEVELAND TRACTOR CO.



1930
CONVENTION &
ROAD SHOW
A. R. B. A.
ATLANTIC CITY N.J.
JAN. 13-18

Cletrac at the

Invitation-



• • and an announcement

ANOTHER great power unit—the CLETRAC “80-60”—has been added to the Cletrac line. With maximum eighty and rated sixty horse power at the draw bar, it is a tractor of real capacity and performance, combining true Cletrac simplicity and accessibility with remarkable power efficiency. Taking its place with the other famous Cletracs—the “Twenty,” the “Thirty,” the “Forty” and the “One Hundred”—this new model extends the Cletrac line to cover every possible power requirement and preference. See this newest Cletrac—at the Road Show. Booth No. 158.

The Cleveland Tractor Company

19323 Euclid Avenue

Cleveland, Ohio

Road Show



The Wehr All-Purpose wheel provides positive **TRACTION** on all road surfaces . . .

A REAL road-gripper and a pusher — that's the Wehr All-Purpose Wheel!

It's built to perform a service no other grader wheel can deliver. With cleats out, the All-Purpose Wheel digs through slippery surfaces down to solid footing. Oozy wet clay or "rubber-gum" on shoulders and in ditches can't glue or spin the wheels. Glassy snow-covered roads are made safe and skidless. If you have clear sailing on solid ground, just put the cleats into the center grooves (see cross-cut illustration) and speed ahead.

This All-Purpose Wheel is just one of the many reasons why the Wehr U-4 Grader always *goes ahead* on difficult maintenance work. We have combined scientific design, massive oversize strength, and dependable traction, to give you *capability* and *service* in our machines!

There is a complete line of Wehr Road Equipment to help you economically build or maintain more and better roads. Write today for information.

WEHR COMPANY, Milwaukee, Wis.

Factory: CUDAHY, WISCONSIN

Features of the Wehr All-Purpose Wheel

- 1 One piece steel cleat with two inch pentagon shank through pentagon hole in wheel rim provides means for raising and lowering cleat as well as locking into working position.
- 2 Note section of tire and wheel rim cut away to show how cleats are raised, turned and self-locked into position for traction in soft earth, loose ground, mud or snow.
- 3 Only three pieces — cleat, spring and cap. A simple and efficient lever is furnished for raising and lowering lugs, only a ten minute job.
- 4 Illustration shows only three cleats raised. Note how lowered cleats lie between tires, out of the way and below the surface of rubber tires.

This wheel covered by basic patents on which all North American rights are exclusively controlled by Wehr Co.

Showing cleats in recessed position.

The Wehr 8 to 10 ton Road Roller surpasses in strength any other road roller of similar size. The Wehr 3 to 7 ton Roller is proportionately massive.



The Wehr H. A. Contractors Special is equipped with Wehr crawlers for sure traction on any road surface. Can also be equipped with All-Purpose Wheels.



A complete display of Wehr Equipment will be shown at Good Roads Show, Atlantic City, N. J. Jan. 13-18, 1930. Space No. 232.

WEHR

ROAD EQUIPMENT



HIDDEN WITHIN ITS WALLS
IS A CONTRIBUTION TO BETTER CONSTRUCTION BY

Sterling

WHEELBARROWS

PALMOLIVE BLDG.

CHICAGO

LUNDOFF-BICKNELL CO.
GENERAL CONTRACTORS

It is the Wheelbarrow which
is the pacemaker on any job.
If they fall down they cause
delay and expense. If they
stand up under hard service
they speed up production.

The stability of the
"Sterling" is the reason for
their preference.

Buy Sterlings for the econ-
omies they create.

Branch offices and warehouses at
Boston, New York, Philadelphia,
Pittsburgh, Cleveland, Detroit,
Chicago, St. Louis.



STERLING WHEELBARROW COMPANY

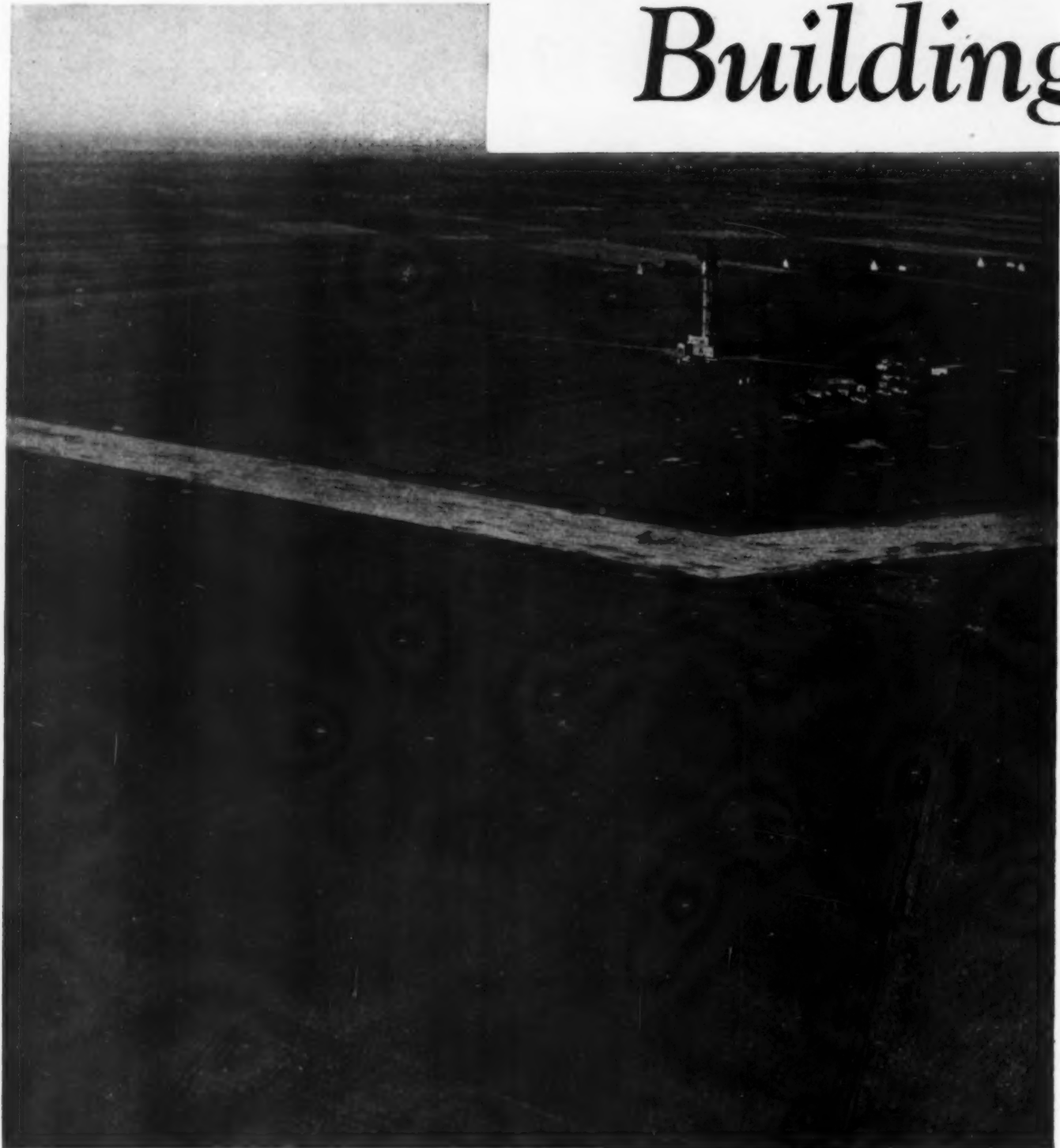
STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

Milwaukee

MANUFACTURED FOR THE EUROPEAN MARKETS BY —
STERLING FOUNDRY SPECIALTIES LTD. STERLING WORKS, BEDFORD, ENGLAND

Wisconsin

Building



Photograph of the taxi-way of the Dominion Government Airport at St. Hubert, Que., Canada. Dibblee Construction Company, Contractors. Colas was used as the bituminous penetration and surface dressing material instead of hot asphalt, due to the fact that construction had to take place during cold weather. Approximately 96,000 square yards of runway and taxi-way were laid out for construction by the penetration method. For the foundation, eight inches of sand and gravel were spread on the graded base, rolled and covered with about five inches of water-bound macadam. After this settled, a course of graded stone was spread, rolled to a depth of about three and a half inches and penetrated with one and a half gallons of Colas per square yard. This was covered with one-half inch stone chips to fill all surface voids, sealed with one-half gallon of Colas, and blinded off. The taxi-way was immediately opened to airplane traffic, and a great amount of valuable time was saved.

Exhibit No. 472. 1930 Convention and Road Show A.R.B.A. Atlantic City, N.J., Jan. 13-18.

an Airplane "Road" in Canada's Cold November with



A HIGHLY important part of an airport is the run-way and taxi-way, which to road builders is simply an airplane "road."

To the contractors on this job came this problem: 96,000 square yards of run-way and taxi-way to be built by the penetration method in cold November weather, long after other road contracts had been closed down due to the impracticability of hot asphalt construction at this season.

For a solution of the problem the contractors turned to Colas because Colas is a bituminous penetration and surface dressing material that is efficiently used at *any* temperature above freezing; because Colas is applied cold, direct from a pressure tank; because Colas produces a hard, smooth, non-skid surface, and because Colas roads can be opened for traffic immediately after completion.

Colas has a seven-year record of success in England, a four-year record in Germany and France. Read the construction data below the photograph on the opposite page, and you will see why Colas, so soon after its introduction to America, is equalling its European success.



Colas is ideal for quick and economical construction or maintenance of all macadam and gravel roads.

Write to our nearest office for complete information.

FLINTKOTE ROADS INC.

(COLAS LICENSEES)

Pershing Square Bldg.
New York

Associated Companies Throughout the World

Park Square Bldg.
Boston



builds durable low cost roads

The New MASTER Ransome 27-E PAVER

MY RANSOME HAS
BEEN IN OPERATION
SIX YEARS AND IS
STILL OKey

I BOUGHT MY
THIRD RANSOME
I THOUGHT IT
WAS THE STURDI-
EST MACHINE ON
THE MARKET

RANSOME SERVICE
HAS MADE ME A LOT OF
MONEY

EVERY UNIT
EASY TO
GET AT!!

SOME IDEA
THAT
GEAR BOX

A FLEXIBLE COUPLING
BETWEEN ENGINE
AND GEAR BOX

THE BOOM
SWINGS
THROUGH
170°

POWER DISCHARGE
AND BUCKET DRIVE
IN ONE UNIT

THAT VALVE
DOES'NT-
BY-PASS-
THE TANK IS
ALWAYS
ACCURATE

SEE THAT
ONE PIECE
MAIN FRAME

HERE IS A
PAVER I WANT-
SEE THAT
SUPPORTING FRAME



Visit

the *Ransome* **BOOTH** at the **ROAD SHOW**
No 218

Ransome Concrete Machinery Company

1850—Service for 80 Years—1930

Dunellen

New Jersey

1930
CONVENTION &
ROAD SHOW
A. R. B. A.
ATLANTIC CITY N.J.
JAN. 13-18

WARCO

(The Pioneer One-Man Grader)



WARCO
BUCYRUS
OHIO

*alone -
gives all these*

Center and Rear Control Models
Crawlers and Wheels Interchangeable
I-Beam Frame • "Built like a Bridge"
Head Type Steering • "Steers like an Auto"



**You can
do better
work
with
WARCOS**

Rear Type Crawlers • for
Construction • Rubber tired
wheels for Maintenance
on both center and rear
control models

**You Are Interested
In Better Roads - So
Are WARCOS -**

They save time, labor, get
more work done, cut down
your repair bills, and with
Bulldozer, snowplow and
scarifier attachments they
work every day.



There are no better tools for Contractors and Public Officials who
have Roads and Streets to build and maintain than WARCOS

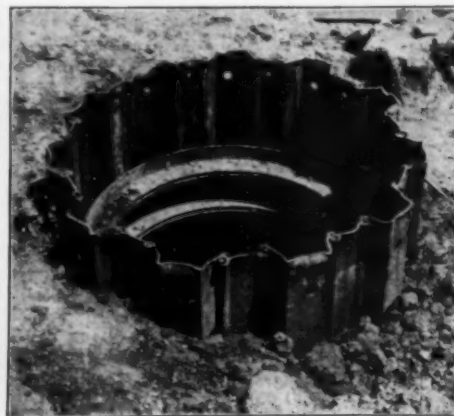
Machinery idle half the time pays no profits

W.A. RIDDELL COMPANY BUCYRUS OHIO, U.S.A.
POWER & DRAWN GRADERS - WHEELED SCOOPS - REAR TYPE CRAWLERS

At Matawan, New Jersey

LACKAWANNA STEEL SHEET PILING

in Circular Piers



for support of abutment of new highway bridge over Matawan Creek

Forty-foot lengths of Lackawanna Deep-Arch Piling Section DP165 and Straight-Web Section SP8a were driven alternately to form three cylinders, each approximately 7 feet in diameter for piers to support the abutment of the new highway bridge over Matawan Creek at Matawan, N. J.

As excavation inside the cylinders progressed, double steel angle ring braces were placed inside, as shown in the photograph to the left. The cylinders were filled with concrete and the sheet piling left in place.

There is a Lackawanna Piling Section — Deep - Arch, Arch - Web or Straight-Web — for your particular purpose. Write for literature describing the complete line of Lackawanna Piling Sections.

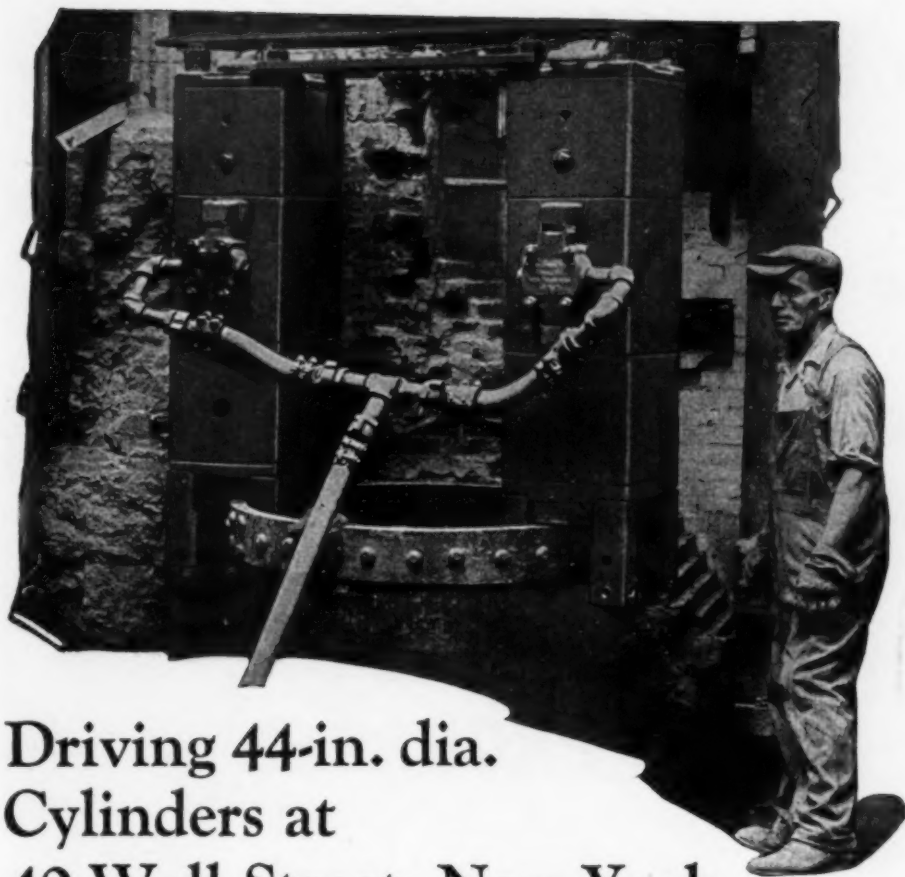
KOLYN
CONSTRUCTION CO.
Trenton, N. J.
Contractors



BETHLEHEM

BETHLEHEM STEEL COMPANY General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, Seattle, San Francisco, Los Angeles, Portland, Honolulu.



Driving 44-in. dia. Cylinders at 40 Wall Street, New York

MCKIERNAN-TERRY No. 6 Pile Hammers were responsible for driving down, not the stock prices on Wall Street, but large diameter steel cylinders for the foundations of the new Bank of The Manhattan Company Building, 40 Wall Street, New York. When completed, this building will "look down" on the famous Woolworth Building.

In all six cylinders were driven to 32-ft. penetration through sand and hardpan with McKiernan-Terry Pile Hammers operated by air. Three of the six hammer-driven cylinders, 52 in. dia., were put down with one McKiernan-Terry No. 9-B-2 Hammer, acting at the center of a girder placed across the top of the cylinder. The other three, 42-in. dia., were driven by two No. 6 Pile Hammers working in tandem as shown above. McKiernan-Terry Hammers also drove hundreds of smaller pipe piles on this job.

McKiernan-Terry double-acting pile hammers are always found on the large construction jobs the world over from far away Japan to South America, always driving or pulling on land or under water.

Write for a copy of the McKiernan-Terry pictorial catalog describing some of these large construction jobs.

McKiernan-Terry Corporation
19 Park Row, New York
Distributors in Principal Cities



NATIONAL HOISTS- STEELE & CONDUCT BRIDGE MACHINERY
McKIERNAN-TERRY **DOUBLE ACTING**
PILE HAMMERS



"Linc-Weld" Superiority
is due to:

1. Larger Shaft through Motor
2. Larger Bearings
3. Better Insulation
4. Stronger Frame (Steel)
5. Greater Overload Capacity

TRADITION

PROGRESS

"Here, Lad—

The matter is now up
for renewal of our
motor contract.

If those 'Linc-Weld'
motors you talk so
much about have some
really evident features,
I'll try to see through
them."

"No, Pop—

see them through would be better.

First they're STEEL—you can
SEE that, so you can see
better strength and modernism.

The shafts and bearings are bigger—you can SEE
that, so you can see less bearing troubles.

They have more active material and larger ventilating
ducts — you can SEE that, so you can see greater
overload capacity and cooler motors.

It's the *modern* motor and like the modernly dressed
woman it has BACKBONE that you can SEE."

THE LINCOLN ELECTRIC COMPANY
Department No. 32-1 CLEVELAND, OHIO

M-59

LINCOLN
"LINC-WELD" MOTORS

Roebling

Wire Rope and Wire

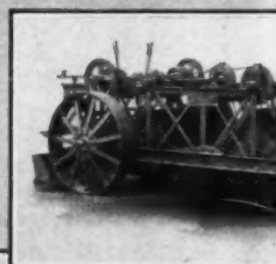
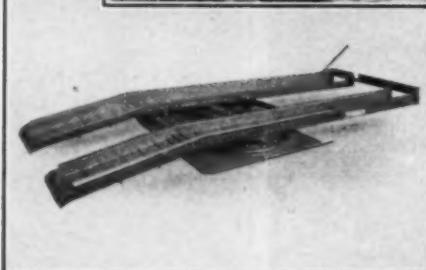
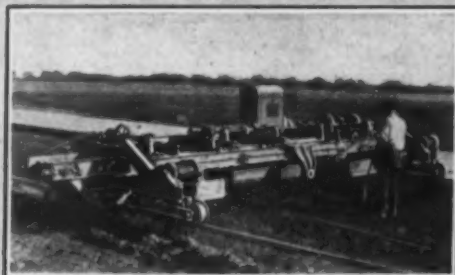
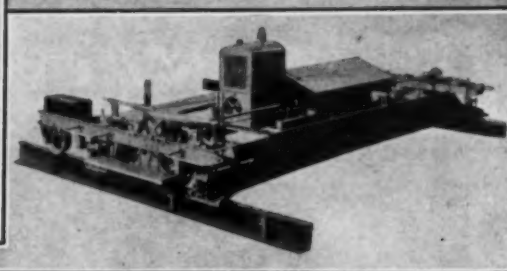
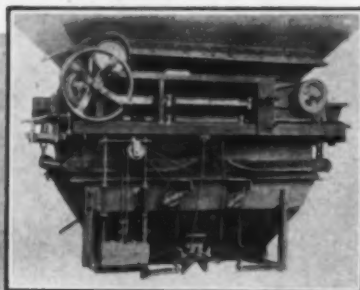
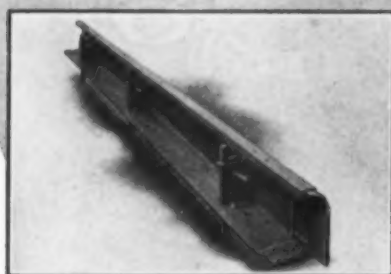
Wire Rope and Wire are essential means of our modern civilization—indispensable in every form of industrial life.

Over eighty years' experience in supplying wire rope and wire for the world's greatest engineering, mining and industrial projects enables us to embody our fundamental feature to meet



John A. Roebling's Sons Company
• Trenton, • New Jersey •

Headquarters for



MORE THAN EVER IN 1930—

BLAW-KNOX continues to make road building an easier and more remunerative job for the contractor.

It pays to deal with Blaw-Knox—and it will pay you to visit our booth at the ROAD SHOW in Atlantic City and inspect the complete line of BLAW-KNOX ROAD BUILDING EQUIPMENT.

Blaw-Knox Men will be there to meet you, greet you, and show you around.

BLAW-KNOX COMPANY
2086 Farmers Bank Bldg., Pittsburgh, Pa.

New York Cleveland Philadelphia Chicago
Detroit Birmingham Boston Buffalo Baltimore

Export Division:

Miliken Bros.—Blaw Knox Corp., Canadian Pacific Bldg.,
New York



IT PAYS TO DEAL WITH



BL

ROAD BUILDING *Equipment*

ROAD FORMS

ORD ROAD FINISHERS

BATCHERPLANTS

BATCHERS—WEIGHING, VOLUME
and INUNDATION

STEEL FORMS for
STREETS and SIDEWALKS

BALL WAGON GRADER

NU-METHOD FINISH GRADER

TRUCK TURNTABLES

STEEL BINS ALL
CAPACITIES

CLAMSHELL BUCKETS

AGITATOR TRUCK BODIES

READY MIXED CONCRETE PLANTS

AW-KNOX



**"We Create
PRICE ADVANTAGES
For Consumers**



Above—Mr. E. C. Poehler, Vice President of Crerar, Adams & Company of Chicago, Illinois. This company's services are of a definite economic value to the prosperity of its business territory.

WE offer all consumers of Industrial Supplies a stock diversity that means money to them, which fact becomes more apparent when a check-up is made on the time and experience needed to analyze our natural field, so that the best merchandise for the least money may always be available for our friends. We recommend Republic's Belting—Hose—Packing—Molded and Lathe Cut Goods."

The above statement is characteristic of those made by prominent distributors all over the country. It explains in part how the Industrial Supply Distributor, helping to solve the important problem of broad markets and economical distribution, upholds high quality, maintains fair prices and saves needless efforts on the part of both consumer and manufacturer.

**THE
REPUBLIC RUBBER CO.**

**Youngstown
Ohio**



**REPUBLIC means
the Best Mechanical
Rubber Goods**



Invader Belting is as old as is Republic (28 years.) Invader will work satisfactorily anywhere, except on abnormal drives calling for super quality such as in Champion High Speed.

Send for a sample of
INVADER

Good Roads the Year 'Round with MONARCHS

When Monarch power is pushing the snow plow, the deepest, hardest packed drifts are conquered. The picture shows a Monarch "75" and Baker Snow Plow in deep drifts near Sturgeon Bay, Wis. There's plenty of snow . . . and it's packed hard . . . but the Monarch is clearing the way.

Monarchs meet emergencies and overcome them with irresistible power. Last winter, in Webster County, Iowa, an ice jam buried the road to a depth of 6 to 8 feet. A Monarch "75" was put on the job . . . and the road was plowed clear in short order.

Attachment of Monarchs to snow plows of all types is a simple matter. A direct connection to the power take-off of the Monarch drives the rotary snow plows. Wind-tight cab and electric starter and lights may be had when desired. Write for a copy of "Bucking the Blizzards with Monarchs."

ALLIS-CHALMERS MFG. CO.

Monarch Tractors Division

SPRINGFIELD, ILL.

"75"—"50"—"35"



Allis-Chalmers

Monarch Tractors

A New Success in a Series of Brilliant Achievements

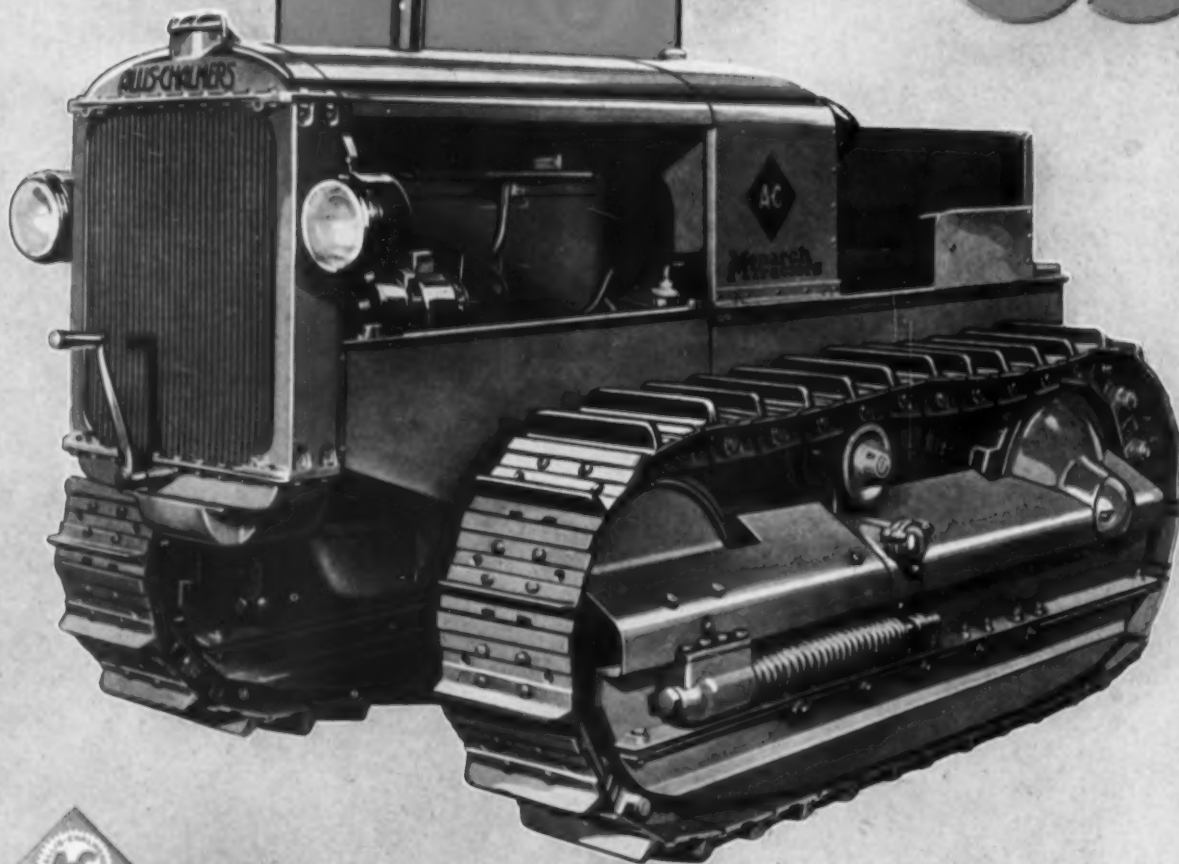
Now comes the Monarch "35" . . . to parallel the achievements of the "75" and the "50" in every detail but size. It is new only in its announcement at this time. Already it has a history of enviable accomplishment . . . equivalent to years of strenuous service. It represents the engineering skill of an organization more than eighty years old in knowing how . . . Confidently and sincerely, Allis-Chalmers offers the "35" . . . and in keeping with the company's policy, complete satisfaction is guaranteed . . . To build the greatest tractors that man's ingenuity can devise and machines produce . . . and to sell them at the lowest cost per drawbar horsepower . . . this is the seemingly impossible which Allis-Chalmers has made a fact in the "35", the "50", and the "75".

ALLIS-CHALMERS MANUFACTURING CO.

Specialists in Power Machinery Since 1846
Monarch Tractors Division
SPRINGFIELD, ILL.

"75" — "50" — "35"

THE "35"



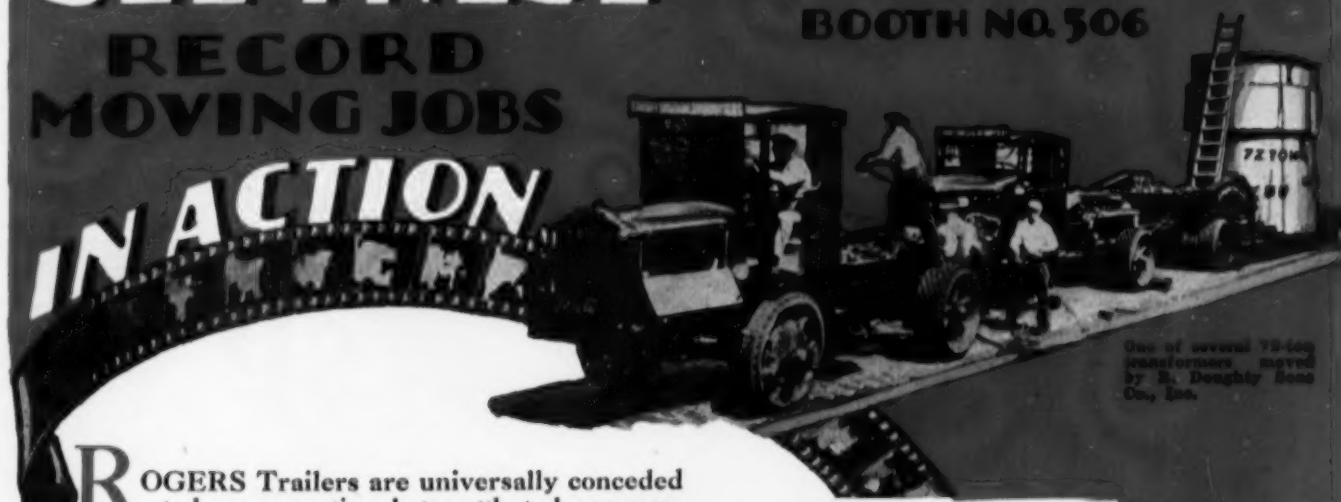
Allis-Chalmers
Monarch Tractors

SEE THESE *at the ROAD SHOW*

RECORD MOVING JOBS

IN ACTION

BOOTH NO. 506



One of several 75-ton transformers moved by R. Doughty Sons Co., Inc.

ROGERS Trailers are universally conceded to have exceptional strength, to be uncommonly easy to load and to embody remarkable ease of handling. They enjoy the greatest general popularity and are identified with a majority of the noteworthy moving jobs.

Several such contracts, which have created a stir of interest because of their unusual character may be seen in action at the Road Show.

In studying these large trailers it is significant to note that the same design factors, the same patented features and equally liberal factors of safety are built into every unit of the complete line, even including the small five-ton unit.

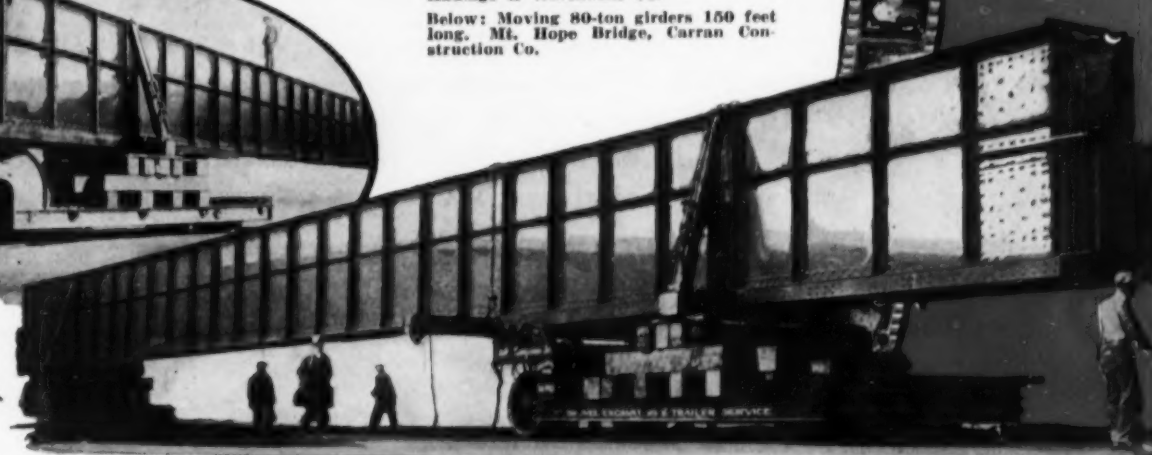
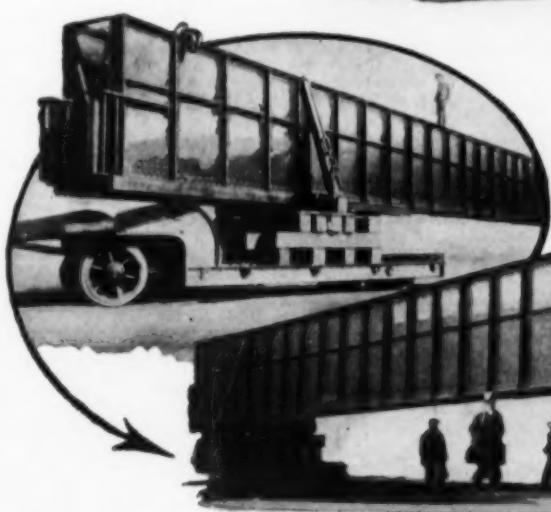
ROGERS
World's Standard
HEAVY DUTY TRAILERS

See this exhibit and read Rogers Catalog No. 28 before buying a trailer.



Above: One of several street cars moved in New York City by Gerson Haulage & Warehouse Co.

Below: Moving 80-ton girders 150 feet long. Mt. Hope Bridge, Carran Construction Co.



ROGERS BROTHERS CORPORATION

106 Orchard St., Albion, Penna.



To Jump—or Not to Jump

Experienced users of magnetos know that tracking of carbon dust is one of the most troublesome features of brush type distributors—and yet practically all ordinary magnetos use brush distributors.

Modern practice has changed all this. Splitdorf Jump-spark Magnetos (Model B) cannot track for the simple reason that there are no carbon brushes to leave a conducting trail in the distributor. In ordinary magnetos you will find a half-dozen brushes, more or less, delicately held in place by as many springs. In a Splitdorf (Model B) Magneto distributor block you will find no mechanism whatever.

Instead of distributing its current through brushes, the Splitdorf Jump-spark Magneto actually *jumps* it from the distributor spool to the distributing wires by means of a bright, blue spark. Nothing gets out of order for the simple reason that there's nothing there to get out of order!

Tell your dealer to supply you with Splitdorf Jump-spark Magneto (Model B) for your portable power equipment. No other magneto sold for contractor's equipment is so electrically perfect — so simple — so trouble-free!

SPLITDORF

MODEL-B



SPLITDORF ELECTRICAL CO., NEWARK, NEW JERSEY

SULLIVAN Branch Offices and Distributors blanket the entire country with Sullivan Service. Call on them for help at any time.

Sullivan Offices

BIRMINGHAM, ALA.	LOS ANGELES, CALIF.
BOSTON, MASS.	MUSKOGEE, OKLA.
BUTTE, MONT.	NEW YORK
CHICAGO, ILL.	PITTSBURGH, PA.
CLAREMONT, N. H.	POTTSVILLE, PA.
CLEVELAND, OHIO	SALT LAKE CITY, UTAH
DALLAS, TEXAS	SAN FRANCISCO, CALIF.
DENVER, COLO.	SCRANTON, PA.
DULUTH, MINN.	SPOKANE, WASH.
EL PASO, TEXAS	ST. LOUIS, MO.
HUNTINGTON, W. VA.	TERRE HAUTE, IND.
JOPLIN, MO.	TORONTO
KNOXVILLE, TENN.	VANCOUVER

Sullivan Distributors

ALBANY	Sager-Spuck Supply Co.
ASHLAND, KY.	Porter Supply Co.
ATLANTA	W. C. Caye Co.
BAKER, ORE.	Basche-Sage Hdwe. Co.
BALTIMORE	Industrial Power Equip. Co.
BARRE, VT.	Granite City Tool Co.
BIRMINGHAM, ALA.	Smith Meadow Supply Co.
BLUEFIELD, W. VA.	Porter Supply Co.
BOISE, IDAHO	Idaho Equip. Co.
BOSTON	Waldo Bros. & Bond Co.
BUFFALO	Joseph C. Fiorello Co.
CHARLESTON	Baldwin Supply Co.
CHARLOTTE	Carolina Tractor & Equipment Co.
CHATTANOOGA	Mills-Lupton Supply Co.
CHICAGO	Superior Supply Co.
CINCINNATI	Consolidated Equip. Co.
CLEVELAND	Day and Maddock Co.
COLUMBUS	Consolidated Equip. Co.
DALLAS	J. W. Bartholow Co.
DAVENPORT	Gierke Robinson Co.
DENVER	Wilson Machinery Co.
DES MOINES	Globe Machry. & Sup. Co.
DETROIT	Hunter Machinery Co.
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GRAND RAPIDS	Hunter Machinery Co.
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HOUSTON	R. B. Everett & Co.
JAMESTOWN, N. Y.	Joseph C. Fiorello Co.
JOPLIN, MO.	Joplin Supply Co.
KANSAS CITY	Funkhouser Equip. Co.
KNOXVILLE	Dempster Equip. Co.
LITTLE ROCK	Frank Wriggle
LOS ANGELES	Brown Bevis Co., Inc.
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MOBILE, ALA.	McGowan Lyons Co.
MONCTON, N. B.	Gen. Supply Co. of Canada, Ltd.
MONTREAL	Gen. Supply Co. of Canada, Ltd.
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OMAHA	American Mechry. Sup. Co.
ORANGE, N. J.	Staats Abrams
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PITTSBURGH, PA.	Allegheny Equip. Corp.
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POTTSVILLE, PA.	Potsville Supply Co.
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SAN FRANCISCO, CALIF.	Stand. Equip. & Sup. Co.
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ST. CLOUD, MINN.	St. Cloud Iron Works
ST. LOUIS, MO.	O. B. Avery Co.
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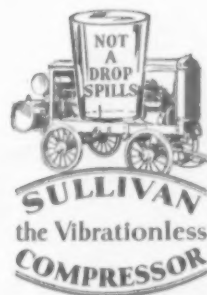
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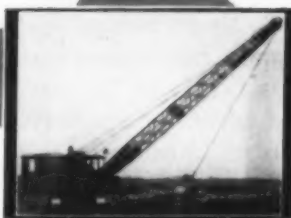
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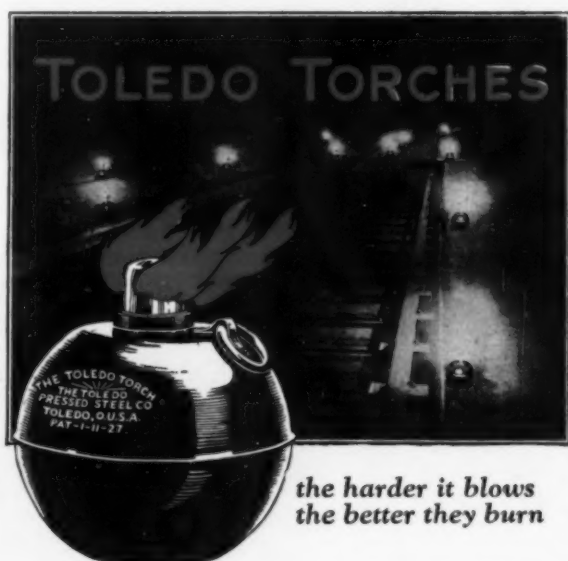
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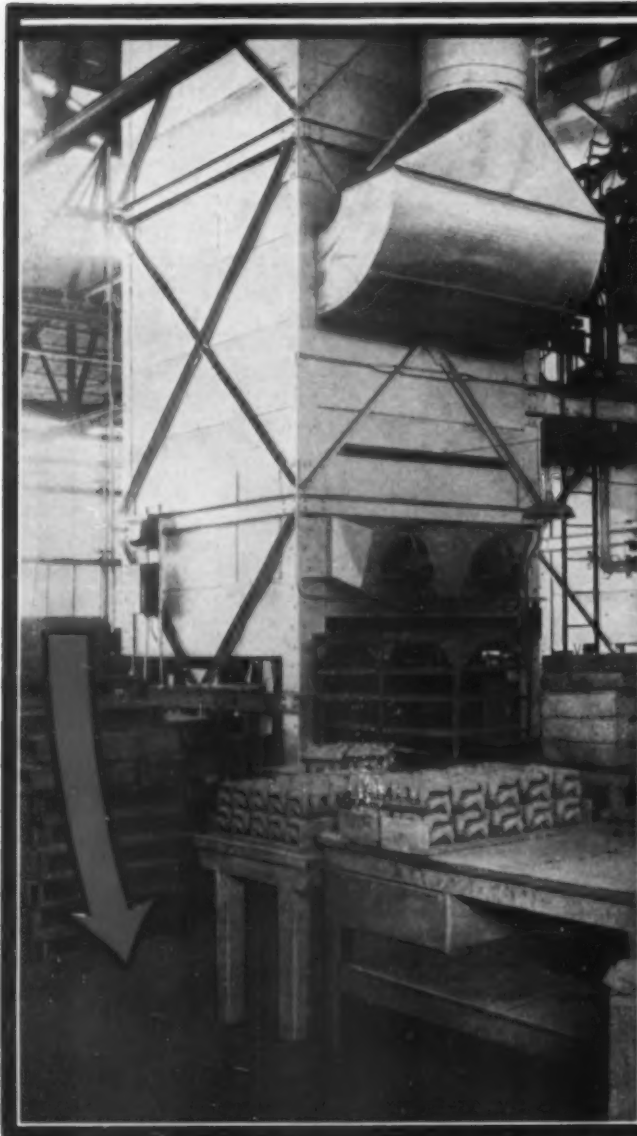
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37-ton coke ovens in the Muskegon, Mich., plant of the Campbell-Wyant and Cannon Foundry Co. were mounted on the second day and put in operation the third day after *High-Early-Strength* Concrete foundations were placed. Fred Wagner, plant engineer; Peter Ramberg, construction superintendent.

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ROBERT K. TOMLIN, *Editor*

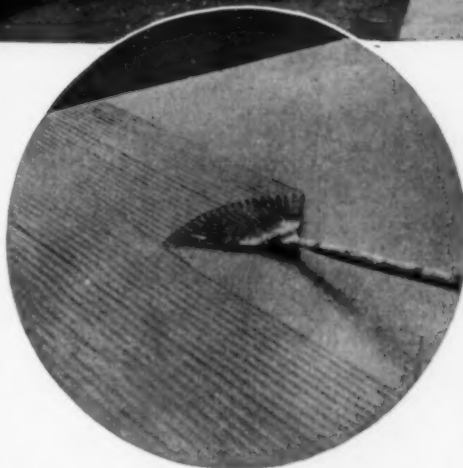
VOLUME 12

NEW YORK, JANUARY, 1930

NUMBER 1



SECOND 20-FT. STRIP of pavement is constructed 50 ft. from existing slab, shown at left. Subgrade is kept clear by using batch boxes instead of end dump trucks. By pouring new pavement in two 10-ft. lanes, straw may be used twice for curing.



ALUMINUM BROOM (*left*), with ends of metal ribs bent down, forms corrugations $\frac{3}{8}$ to $\frac{1}{2}$ in. deep to prevent skidding. During 2 years since this method of scoring surface was adopted in Delaware, no scaling has developed.

DELAWARE is one of the first states to start the construction of dual roads for the elimination of accidents due to glaring headlights. In doubling the width of $7\frac{1}{2}$ miles of the Du Pont Highway, south of Wilmington during the last season, the State Highway Department chose to build a 20-ft. strip of slab 50 ft. (edge to edge) from the existing pavement, at a cost of \$360,000. The right-of-way for this section is 150 ft. wide.

This new 20-ft. pavement was poured in two 10-ft. strips. The second strip was placed 8 days after the first, when the straw that had been used for curing could be moved over to the new strip. This procedure saved double hauling of the straw.

The 1:2:4 mix for the 8-in. slab was proportioned by weight. A 2-per cent calcium chloride solution accelerated setting and aided curing. The slab

To make the heavy corrugations for roughing of the surface, as practiced in Delaware for the last two years, a fan-shaped aluminum broom, with the ends of the metal ribs bent down, was drawn across the top of the slab just before the concrete took its initial set.

The corrugations are from $\frac{3}{8}$ to $\frac{1}{2}$ in. deep, penetrating to the stone aggregate. This method of roughing the surface has proved very effective in preventing skidding. No scaling has developed in the 2

years, since the practice was adopted.

In the 50-ft. strip between pavements, conduits have been placed for removal of the pole lines and grass seed has been drilled to prevent wash and to beautify the narrow park.

The work was performed by the Old Line Construction Co., of Chestertown, Md., under the direction of W. W. Mack, chief engineer, Delaware State Highway Department.

Delaware Builds A DUAL HIGHWAY

By E. E. DOWNING

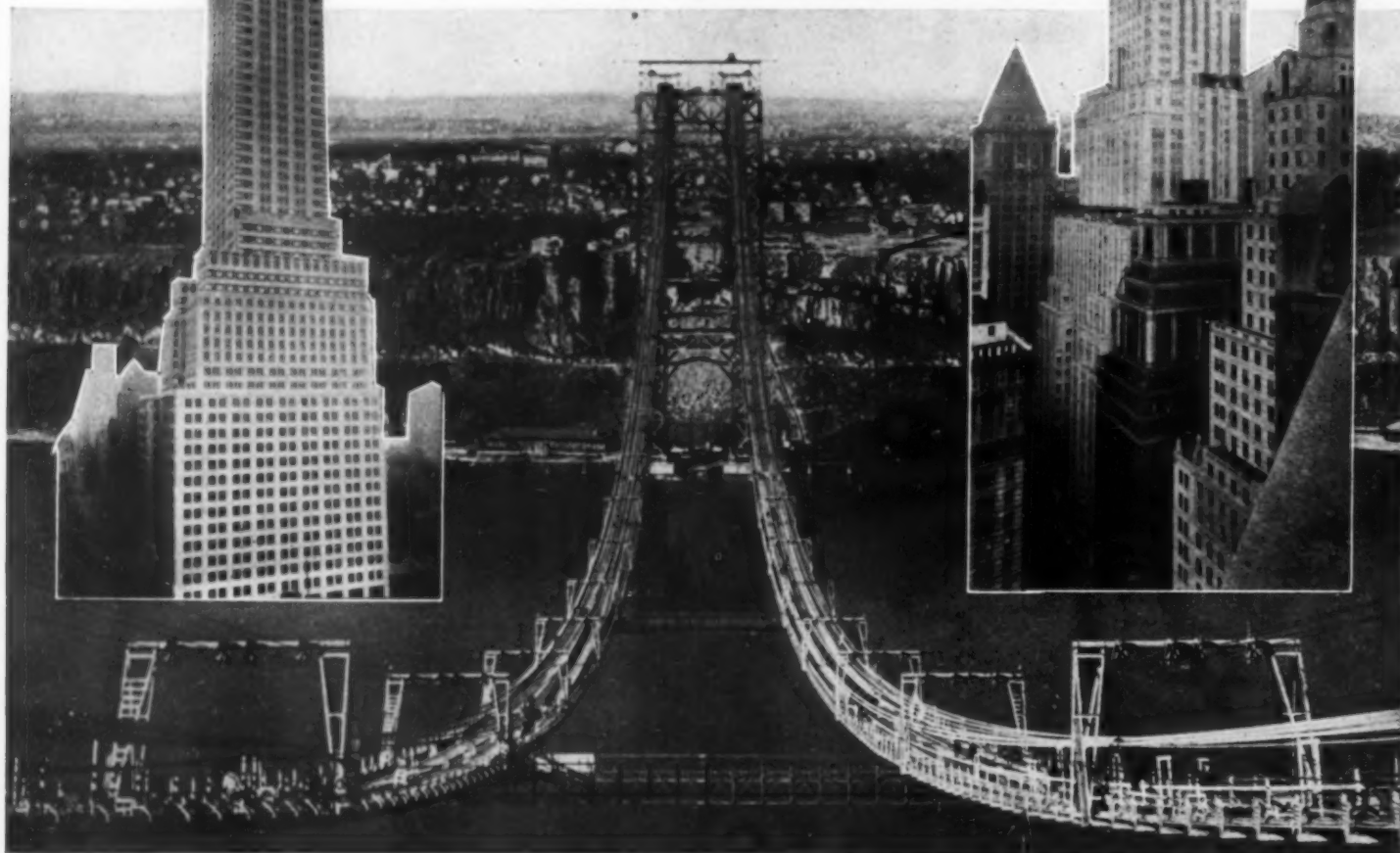
*Resident Engineer,
State Highway Department,
Wilmington, Del.*

was covered with wet burlap for 4 hours and then with moist straw for 8 days. Reo 3-ton dual-pneumatic-tired trucks carried loads of three six-bag batches in steel boxes to the Koehring 27-E mixer.

This Month's "News Reel"

CHRYSLER BUILDING (left), New York City, with aid of 185-ft. finial tower, reaches unprecedented height of 1,044 ft. Steel erection was completed Nov. 7. Fred T. Ley & Co., general contractor.

BANK OF MANHATTAN BUILDING (right), 40 Wall St., New York City, rises 925 ft. above sidewalk. Last piece of steel was erected Nov. 12. Starrett Brothers, Inc., general contractor.

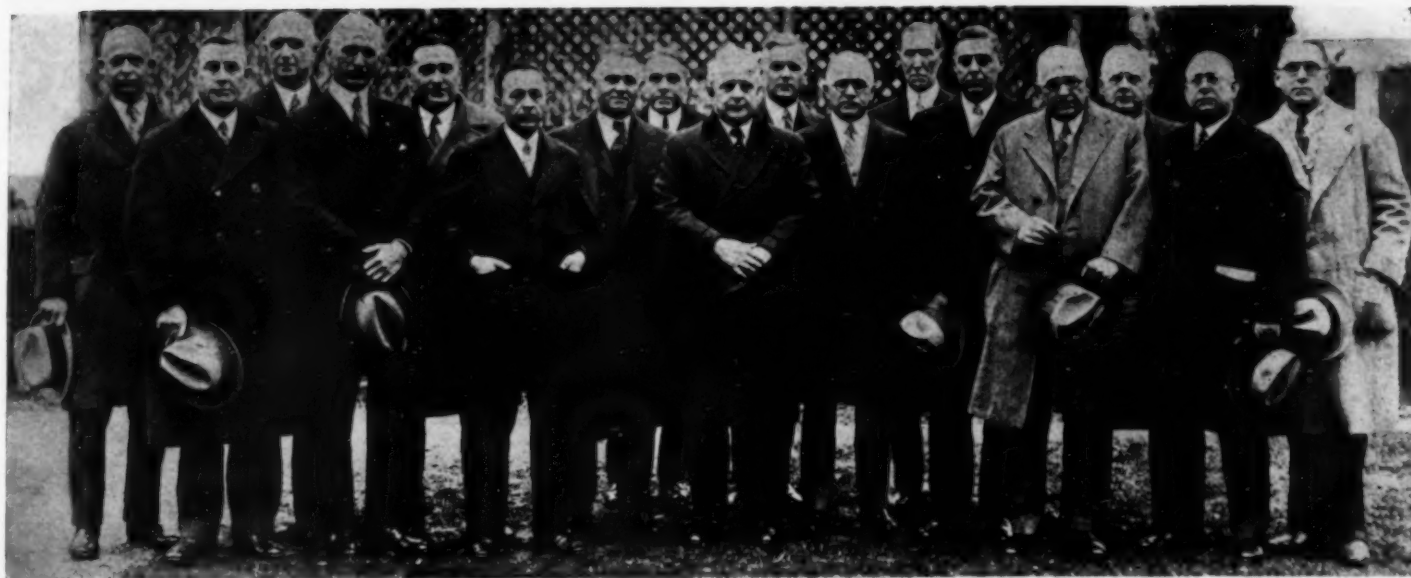


©Boring Gallery

CABLE CONSTRUCTION on Hudson River bridge between New York City and Fort Lee, N. J., proceeds rapidly under management of John A. Roebling's Sons Co., cable contractor. Four 36-in. cables, containing 26,474 wires each, are being spun.



FIFTY TONS OF EXPLOSIVES break off more than 300,000 cu.yd. of rock for Pacific Gas & Electric Co.'s Salt Springs Dam on Mokelumne River, Calif. Note shovels in lower right corner moved just beyond limit of blast.

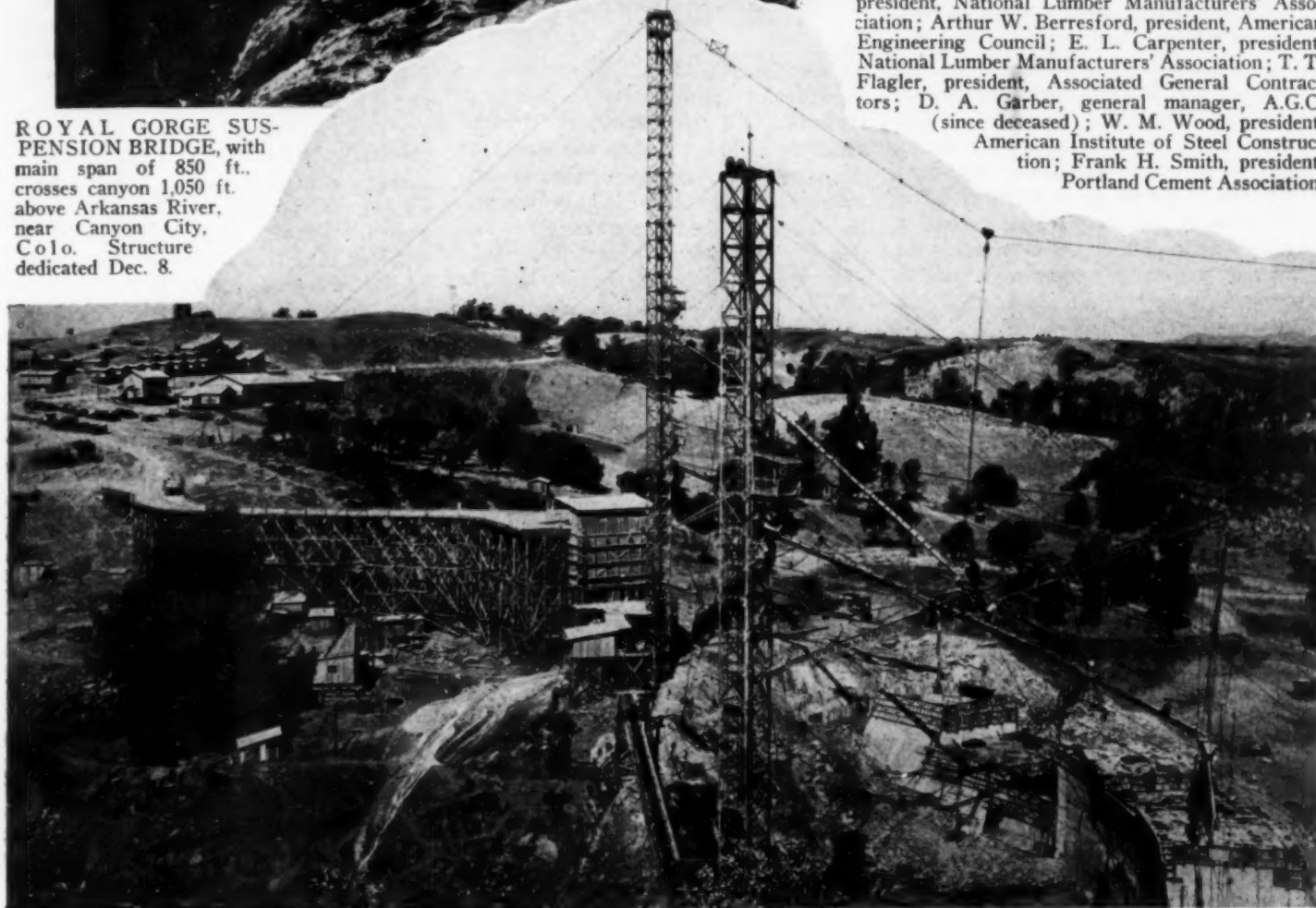


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ROYAL GORGE SUSPENSION BRIDGE, with main span of 850 ft., crosses canyon 1,050 ft. above Arkansas River, near Canyon City, Colo. Structure dedicated Dec. 8.

CONSTRUCTION LEADERS give President Hoover encouraging reports on present condition and future prospects of building industry. (Left to right) F. W. Reimers, president, Southern Pine Association; D. T. Riffe, president, National Building Trades Employers' Association; Samuel Eckels, president, Association of State Highway Officials; Frederic A. Reimer, president, American Road Builders' Association; C. M. Upham, managing director, American Road Builders' Association; A. Trieschmann, president, Home Modernizing Bureau of the National Building Industry; A. M. Lewin, president, Retail Lumber Dealers' Association; Sam Hotchkiss, president, National Association of Builders' Exchanges; Secretary of Labor James J. Davis; Wilson Compton, vice-president, National Lumber Manufacturers' Association; Arthur W. Berresford, president, American Engineering Council; E. L. Carpenter, president, National Lumber Manufacturers' Association; T. T. Flagler, president, Associated General Contractors; D. A. Garber, general manager, A.G.C. (since deceased); W. M. Wood, president, American Institute of Steel Construction; Frank H. Smith, president, Portland Cement Association.



CALAVERAS DAM, a flood-control structure being built by Bent Brothers, Inc., Los Angeles, for city of Stockton, Calif., will contain 105,000 cu.yd. of concrete. Completion is scheduled for May. Methods of handling concrete are clearly shown.



SOD DIKES

for Highway Across



ON THE New Jersey coast 20 miles north of Atlantic City, Monihan & Hall, Inc., of Ocean City, N. J., is building for the State Highway Department a type of hydraulic fill peculiar to the tidewater meadows of this section. Between walls of sod built up with blocks of peat cut from the surface of the swampy meadows, a hydraulic fill is pumped in and is retained. The load of the fill is placed upon 10 to 33 ft. of muck, no effort being made, except at bridge approaches, to excavate this layer of vegetable matter and mud to the solid sand bottom which underlies the whole area.

Description of Project—The section of new road under construction, 6.92 miles in length, is the state's portion of a new route which will shorten the distance from Atlantic City to Tuckerton and New York by 10 miles. Atlantic County will extend its road north of Atlantic City to connect with the state-built section, which runs south out of Tuckerton to Little Beach. All but 1 mile of the state's section lies over salt marshes and tidal streams.

Average depth of muck on

SOD MASON (*left, above*) takes blocks of peat passed to him by line of pitchforkers and places them in wall. Sod blocks are obtained by stripping portion of meadow surface between dikes to depth of 18 in.

the meadows is 22 ft., and the average elevation of the meadow surface is 2. Hydraulic fill to be paid for by the state, as included within the limits of the construction cross-section, is estimated at 800,000 cu.yd. This quantity, because it makes no allowance for settlement or shrinkage, is much less than the actual yardage to be placed. In view of this fact, the contractors' bid

price of 42c. per cubic yard appears moderate.

Sod Dikes—The most unusual feature of the work is the construction of sod walls to retain the fill. Final grade of the sand fill is 7.3. Dikes 7 ft. wide at the base and 3 ft. wide at the top are built up with blocks of sod cut from the strip of meadow between the banks. The dikes are 60 ft. apart, inside toe to inside toe. A 5-ft. berm of natural sod is left untouched along each inside toe. The remaining 50 ft. between the dikes is stripped to a depth of 18 in. by laborers who cut the sod into blocks approximately 6x12x18 in. in size.

The meadows cannot support power equipment for cutting and hauling the sod blocks. All work must be performed by hand. A special flat spade, with cutting edge tapered, is used to split the surface of the sod into 6x12-in. rectangles.

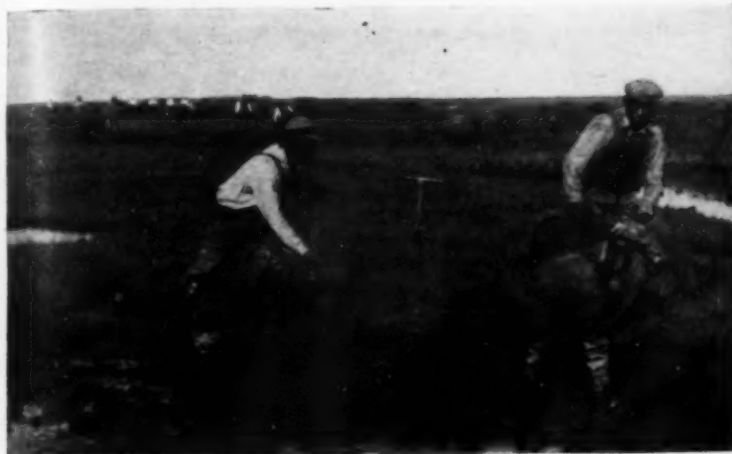
Six men in a crew cut, handle, and place sod blocks in the walls. Standing in a line, they pitchfork the blocks from the cutter to the "mason" who is laying up the courses in the wall.

Sides of sod dikes are built



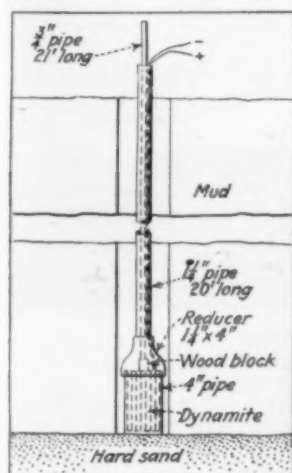
SOD DIKES at each side are built up to height of 7 ft. These walls have not yet reached full height. Remainder of meadow surface between them will be stripped and placed on dikes. (*Above*) SAND FILL, pumped by hydraulic dredge, is deposited from discharge pipe between sod banks, which retain material.

Retain Dredged Fill SALT MARSHES



on an even slope, the blocks being carefully placed with the 18-in. length extending into the wall. The center of the wall is constructed more heterogeneously. Depending upon the amount of sod obtained from stripping, the walls are built up to 1 ft. or more above the minimum height for retaining the fill.

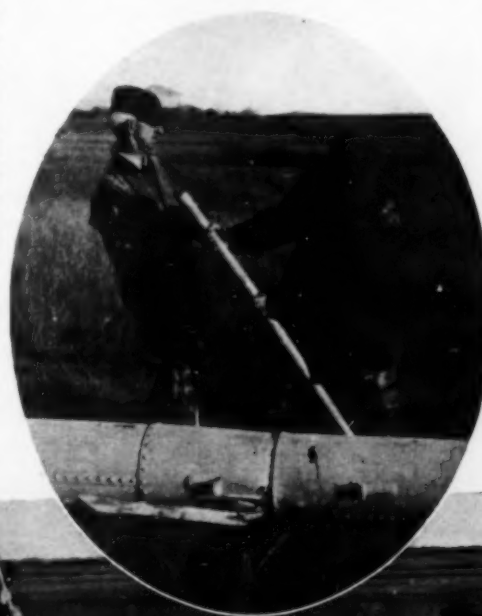
Considerable shrinkage, often amounting to 50 or 75 per cent, occurs in the hydraulic fill. After the fill has become settled at grade, a General excavator operating a $\frac{1}{2}$ -yd. clamshell bucket digs a trench to the sod bottom along the inside of each dike. The sod banks then are torn down and are laid up on a 3:1 slope against the side of the fill. This sod revetment prevents erosion by rains and storm tides.



LOADING DEVICE for placing dynamite charges in jetted holes 20 ft. deep, filled with water.

SOD CUTTER (right, above) splits surface into 6x12-in. rectangles, pushing special spade to depth of 18 in. Workmen with pitchforks pass blocks along to man building dike (at extreme left of opposite page).

Dredge Operation—Three hydraulic dredges are at work on the project, two pumping sand for the fill and one ex-



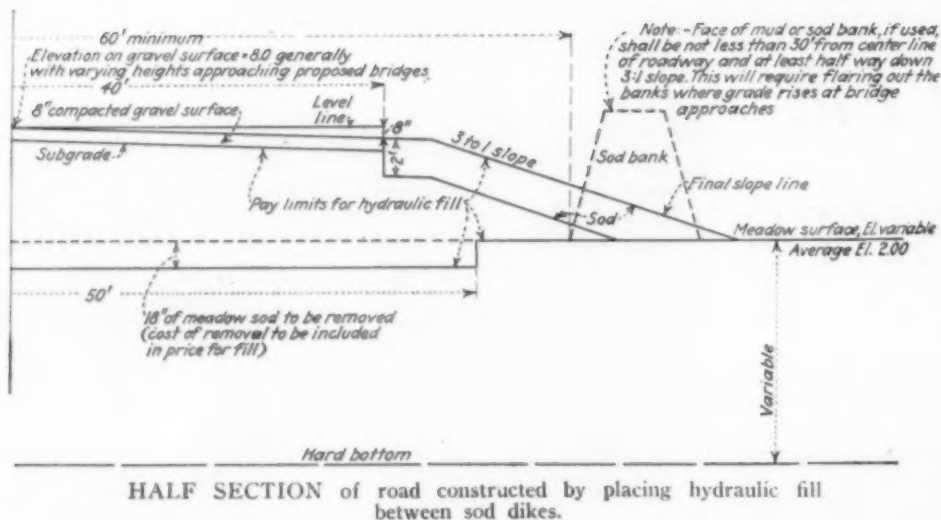
DISCHARGE LINE is made up of 12-ft. sections of riveted 10-gage steel plate pipe. Seams at bell and spigot ends are acetylene-welded. Workmen break joints easily in dismantling pipe line for removal to new location.

cavating muck to hard bottom at the bridge approaches. Of the two larger machines pumping fill, one is a 12-in. dredge equipped with a 300-hp., 60-cycle, 2,200-v., 505-r.p.m. Allis-Chalmers electric motor direct connected to a 12-in. Amsco sand and gravel pump. The second large dredge, operated by W. H. LeChard, of Atlantic City, under sub-contract, has a 16-in. pump powered by a Diesel engine. Neither of these dredges has a cutter. The smallest dredge (8-in. discharge), owned by another sub-contractor, the Harris Dredging Co., Manasquan, N. J., is equipped with a cutter and is driven by Diesel engine. This dredge removes the mud on both sides of the thoroughfares at bridge sites. Sand pumped by the large dredges into the space between the dikes flows ahead as much as 1,000 ft. on a flat slope.

The road lies on the west side of the marshy peninsular between Great Bay and Little Egg Bay. Three suit-



FLAT SPADE, with pipe handle and tapered cutting edge, is used to cut peat blocks from meadow surface.



able locations for the 12-in. electric dredge, all within 2,500 ft. of the road, were available in the creek mouths and coves of Little Egg Bay, less than 2½ miles from Tuckerton. A power line was run from Tuckerton by the Atlantic City Electric Co. to serve the three locations of this dredge, which built the first 3 miles of fill, pumping through pipe lines up to 3,000 ft. in length. The 12-in. dredge pumps 2,000 cu. yd. a day through 3,000 ft. of pipe line. Remainder of the fill now is being built by the 16-in. dredge, which has a capacity of 4,000 yd. a day.

The pipe lines are made up of 10-ft. sections of riveted 10-gage steel plate pipe with bell and spigot joints. Seams are acetylene-welded at the bell and spigot ends. The joints are tight but are easy to make and break. No packing is used. Rubber sleeves are employed to connect the sections of iron pipe in the pontoon portion of the line. Approaches to four small bridges to be built later across navigable thoroughfares are excavated to hard bottom and are filled solid with sand for 200 ft. adjacent to the abutments. At all bridge sites which can be reached

without excessive preliminary dredging, the 8-in. hydraulic dredge pumps out the muck. Sand flows into the excavation from the fill advancing between the sod dikes.

Blasting to Make Fill—At one bridge site, however, it was impossible to bring the small dredge up the shallow stream without excessive dredging. The contractor here tried explosives as a means of making the fill. As explained, in part, by

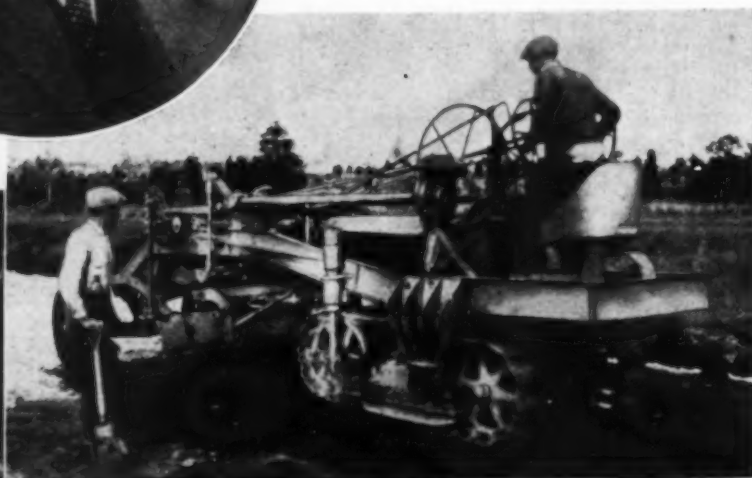


John Swenehart, manager, Agricultural Service Division, Atlas Powder Co., the theory and practice of the blasting operation were as follows:

The peat layer of the meadow is largely water, with only a cellular organic structure containing almost no incombustible material. Using about one-fourth of the amount of explosives which would have been required to throw this material completely out of the area, it was possible to cause apparently complete collapse of the peat, permitting the sand to work down readily. In practice, as much sand as possible was placed on the top to exert a heavy surface pressure and to be immediately available for settling into place after the blast. The first load of sand was probably 4 or 5 ft. thick.

Charges of gelatin dynamite, with 60-per cent nitroglycerin primer to obtain maximum disruptive effect, were placed in loads 6 to 8 ft. apart across the roadway and approximately the same distance apart vertically. A bottom charge of twelve sticks and an upper charge of eight sticks usually were placed in each jetted hole. All charges were connected in series to be fired simultaneously by electricity.

After the blast, fresh sand was deposited by the pumps. This sand appeared to start settling immediately. In a few hours, soundings showed sand extending to solid bottom. As no spoil banks or other evidence of material having been removed were visible, an explanation of what had taken place is interesting. Apparently, the cellular framework of the peat had been collapsed by the explosion to such an ex-

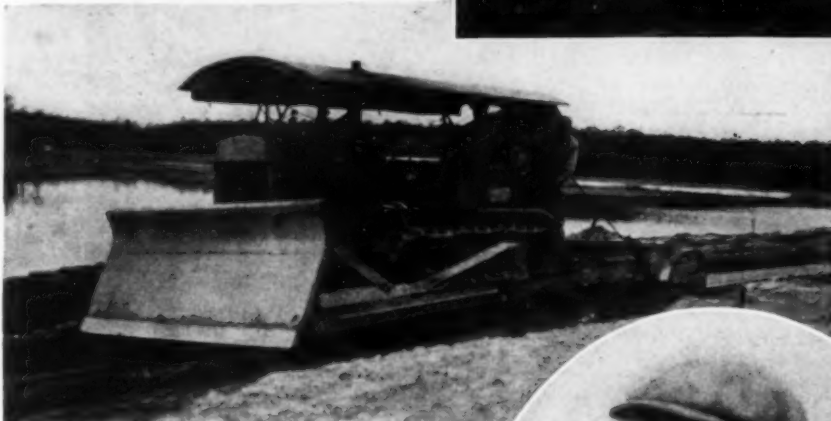
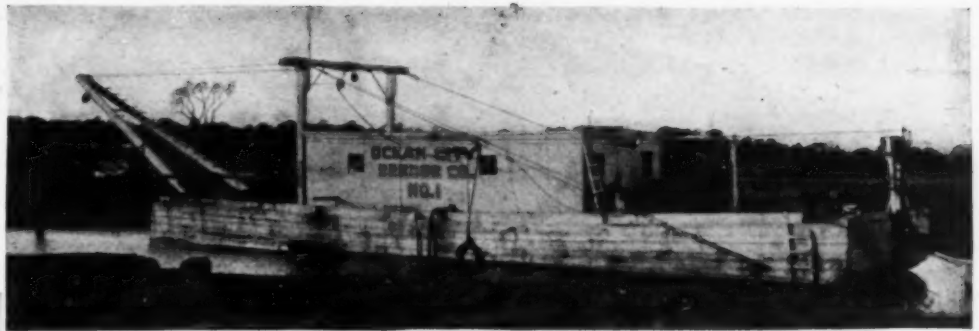


ONE-MAN GRADER, on tractor mounting, spreads dumped loads of gravel on graded fill to form 8-in. compacted gravel surface. (In circle) J. WILSON MONIHAN, of Monihan & Hall, Inc., keeps in constant touch with work.

SOD BLOCK REVETMENT, converted from sod dike, is laid on 3:1 slope against side of fill, after fill has become stable at grade. This sod blanket prevents erosion of side slope.

ELECTRIC DREDGE, supplied with power by 2½-mile extension from main power line, pumps 3 miles of fill through 12-in. pipe line up to 3,000 ft. long.

TRACTOR, equipped with hydraulically-controlled bulldozer and scraper, grades hydraulic sand fill in preparation for spreading of gravel.



tent that little resistance was offered to the movement of the heavy sand. The voids in the sand, of course, afforded ample space to hold the fine, broken-down particles of peat.

Results Obtained by Blasting—Specifications called for a pure sand fill. Inspection of the fill by jetting as the work progressed disclosed a few pockets of muck. Each pocket had to be blasted. At the end of 2 weeks, after using 8,000 lb. of explosives, the contractor obtained a solid fill which still contained a few mud pockets. All in all, the method proved successful, although somewhat tedious.

A handy method of loading holes was devised by G. D. Gaffney, captain of the 12-in. dredge, who had charge of the blasting operations. The sketch shows this scheme. A high explosive



ARTHUR POWELL, superintends operations for Monihan & Hall, Inc.

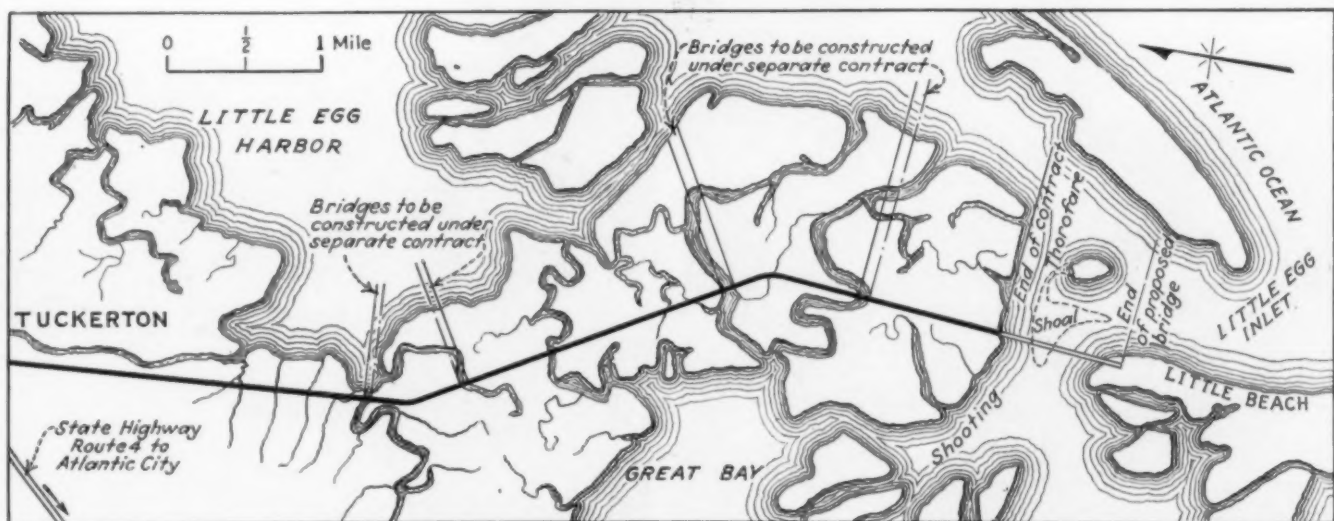
stick was placed in the center of the cluster of eleven slow-burning sticks, and the detonating cap was inserted in this stick. The ¾-in. pipe with the wood block at the lower end held the dynamite at the bottom of the hole

while the larger 1½-in. pipe was withdrawn.

Grading and Surfacing Fill—A Caterpillar 10-ton tractor equipped with a hydraulically-operated La Plant-Choate bulldozer and a MacMillan scraper shapes the top of the fill to receive an 8-in. gravel course. Gravel is excavated by an Erie ¾-yd. steam shovel from a shallow pit about 1 mile beyond the end of the job and is hauled by trucks to the road. A Russell one-man grader mounted on a Caterpillar 2-ton tractor spreads the dumped loads of gravel. For opening the trenches and placing the cast-iron pipe for culverts and drains, the General excavator is used. This machine, equipped as a shovel, made an 8-ft. cut on the first mile at the Tuckerton end of the project.

Oil will be applied to the gravel surface to prevent dusting. The State Highway Department expects to maintain the fill for a number of years, until the muck solidifies beneath the load of sand. Considerable settlement is looked for in places. No pavement will be laid for a number of years, until the fill has become stable.

The men in charge of the work are J. L. Bauer, chief engineer, and Maxwell D. Allen, resident engineer, for the State Highway Department, and Arthur Powell, superintendent, for Monihan & Hall, Inc. J. Wilson Monihan maintains active supervision of operations.



LOCATION PLAN of state-built portion of new route from Tuckerton to Atlantic City. Two of the four small bridges will have bascule spans. Design of 4,000-ft. bridge over Shooting Thoroughfare has not yet been determined.



SHOOTING hot asphalt on Louisiana gravel road with pressure distributor and surfacing with crushed slag.

Louisiana Launches Program of **BITUMINOUS SURFACE TREATMENT**

TO LOWER maintenance costs and improve conditions of traffic on a large mileage of gravel, shell and other types of surfaced road, the Louisiana Highway Commission, under the leadership of Harry B. Henderlite, newly appointed state highway engineer, has inaugurated an extensive program of bituminous surface treatment, a form of improvement comparatively new to Louisiana and adjoining Southern states. The great bulk of the surfaced state highway mileage in Louisiana is of the gravel type, in addition to a sizeable percentage of shell-surfaced road. In dry



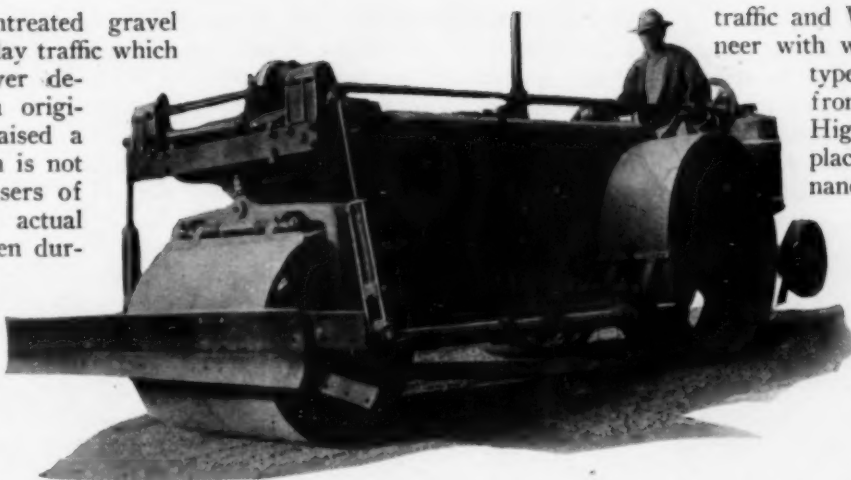
weather these routes are able to handle light traffic satisfactorily, but during recent years the number of fast-moving automobiles and trucks using the state roads has multiplied many fold, with the result that the gravel surfacing, sometimes called upon to carry a daily traffic of as much as 5,000 vehicles, is quickly ground to dust and blown away. Ruts and pot holes form and maintenance costs have soared to meet the necessity of continually replacing and shaping up the gravel or shell surfacing.

Apart from the cost of maintenance is another and even more serious dis-



POT HOLES and ravelled patches in old gravel road (*in oval*) are cut, filled with stone, brought to grade with hot binder (*left*) and rolled. DUMPING PAN (*right*), hooked to truck, facilitates shoveling and saves material.

advantage of the untreated gravel road. Under present-day traffic which these roads were never designed to carry when originally built there is raised a dense dust cloud which is not only disagreeable to users of the roads but is an actual menace to safety. Even during the day time the dust clouds reduce visibility for the motorist to the danger point, while night driving on the gravel roads invites the possibility of collision with other vehicles, particularly in view of the fact that there is considerable laxity on the part of drivers of mule-drawn cotton and farm trucks in maintaining tail lights on their vehicles. The dust, too,



ROLLING of the crushed slag spread on the hot asphalt surfacing is done with a 5-ton gasoline roller.

obscures the headlights of approaching cars. The result has been many collisions on the dust-screened gravel roads.

From the point of view of low cost and construction speed bituminous surface treatment was decided upon as the most effective method of rehabilitating the gravel and shell roads to meet the demands of present-day

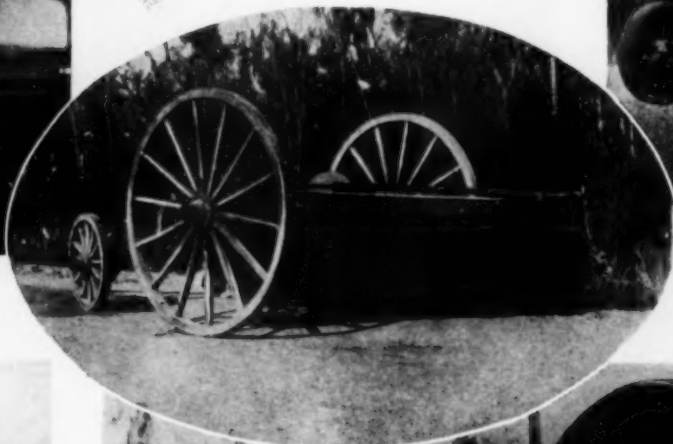
traffic and W. A. Harris, an engineer with wide experience on this type of work, was brought from the North Carolina Highway Department and placed in charge of maintenance operations for the new program of improvement in Louisiana.

On the state highway known as the airline route between New Orleans and Baton Rouge a typical example of the bituminous surface treatment work which Louisiana is doing is afforded by the section between Kenner and La Place.

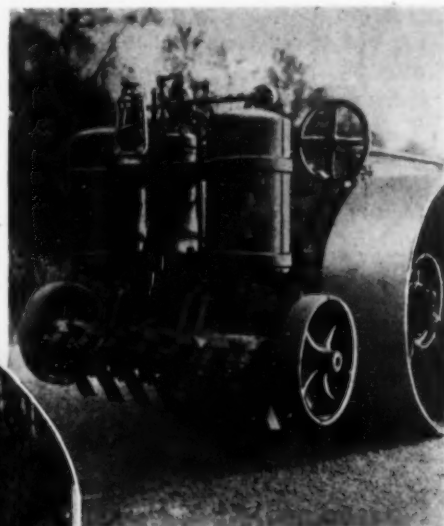
This is a gravel road about 20 ft. wide. The condition of its surface, prior to the repair work, is illustrated by the



W. A. HARRIS, maintenance engineer in charge of bituminous treatment program.



ROTARY BROOM (below) on four-wheel carriage is hauled by motor truck.



SCARIFIER on rear of road roller is operated by compressed air.



PRESSURE DISTRIBUTOR (above and at right) has double-unit heating system and gasoline pressure pump on rear.

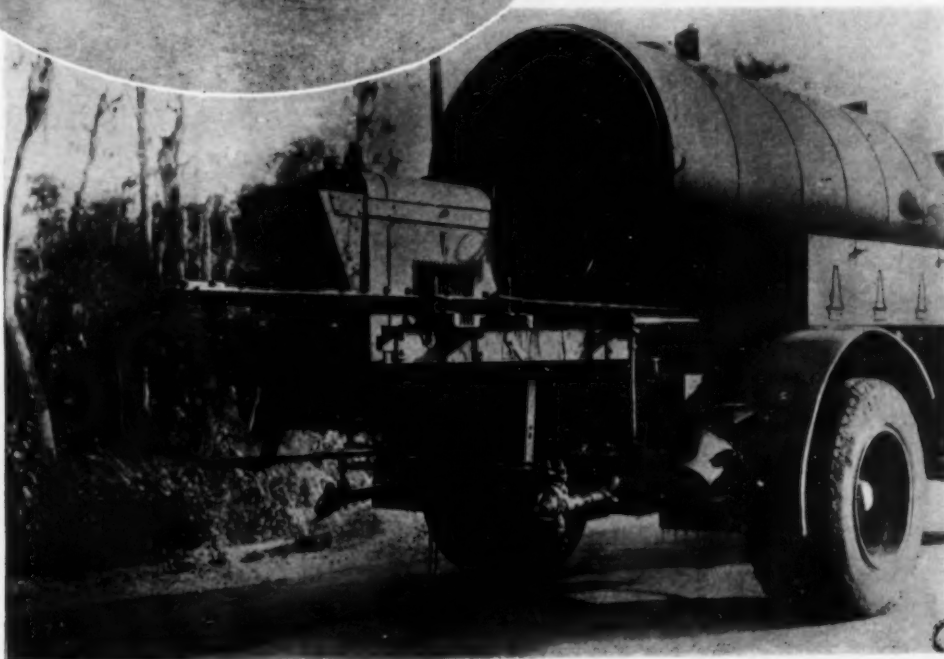


photo (in oval) on p. 50, showing frequent ravelled spots and deep pot holes. The first operation in restoring this highway consists of patching the holes by cutting out around them, filling them with coarse stone and bringing the surface to grade with a hot, coarse-aggregate mixture of bituminous binder. The hot stuff for the patches is delivered by International trucks dumping upon sheet-metal pans hitched to the rear end of the truck. This makes shoveling easy and prevents waste of material, as any excess hot stuff dumped for patching one hole is dragged along on the pan as the truck moves forward to the next patch. Tamping and rolling with a Fordson roller complete the patching. With the old roadway brought to proper grade an Austin rotary broom, hauled by a motor truck, sweeps the surface. The road is then ready for the application of bituminous material to seal the subgrade.

From the plant of the Standard Oil Co. of Louisiana at Baton Rouge fluxed asphalt of 200 penetration is delivered at a temperature of 275 deg. F. in railway tank cars with cork-insulated walls limiting loss of temperature to 5 deg. in 24 hours. As a factor of safety, however, there is a portable steam boiler outfit at the railway siding to heat the asphalt sufficiently to insure a free flow into the truck-mounted tank of the distributor from which it is applied to the road surface.

The distributor is one of the latest model 1,000-gal. Etnyre machines on a

Mack truck which operates at a speed of about 20 miles per hour. Features of this equipment are a double-unit heating system, a pressure pump operated by a separate Le Roi gasoline engine on the rear of the motor truck and a tachometer device which is set to insure the application of the hot asphalt at a constant rate.

On the Kenner-La Place road the surface treatment was originally done in half widths, the distributor being equipped with a 9-ft. bar carrying the spray nozzles. A later revision pro-

vided for a full-width distributor bar as shown in the photo at the top of p. 50. The hot asphalt is applied at the rate of 0.4 gal. per square yard of road surface and is covered by 25 lb. per square yard of No. 4 crushed slag shipped from Birmingham, Ala. The slag is of a size passing a $\frac{3}{4}$ -in. opening. At present the slag is distributed by hand shoveling from small stock piles distributed by truck along the right-of-way but the intention is to supersede this method eventually by the use of a mechanical spreader.

After the slag has been broomed to obtain an even distribution over the road surface it is consolidated and imbedded firmly in the bituminous surfacing by the passage of a 5-ton Austin "Cadet" 3-wheel gasoline roller. Supplementary equipment on this machine, as illustrated on p. 51, includes a scarifier at the rear, controlled by compressed air, and a road-planing blade on the front end. With the rolling completed as the final operation of the surface treatment the road is ready to be opened to traffic. After about a year's service the surface-treated road will receive a supplementary seal coat using a cold application with a surfacing of torpedo sand.

Shell Road—On another route extending northeast from La Place a surface of oyster shells, which are available in the vicinity of New Orleans in abundant quantities, is being prepared for bituminous treatment, as illustrated by the pictures on p. 53. The road is first shaped up with a



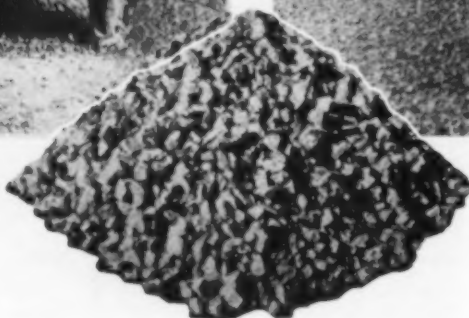
HARRY B. HENDERLITE, state highway engineer of Louisiana.



CRUSHED SLAG is delivered to stock piles along road (insert at right) by light end-dump trucks with flare-boards on body to increase carrying capacity.



BROOMING follows the spreading of the crushed slag on the newly applied surfacing of hot asphalt in order to equalize distribution of material.





TANK CART (above) wets down shell road prior to shaping with blade grader.

crushed slag, rolled with a 5-ton roller.

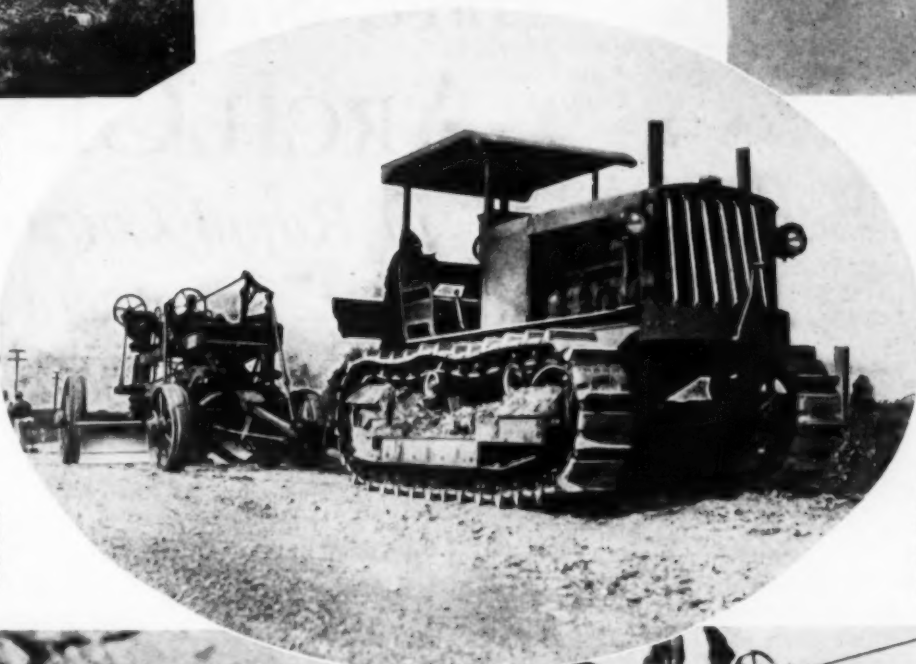
All of this surface treatment work is being handled under the direction of Mr. Harris as an emergency job. Speed is the watchword and the men work an 11-hour day. One crew completed 16 miles of this type of treatment in one month. Labor is hired by the state and is paid at the following hourly rates: Hot top foreman, 80c.; road material men, 45c.; rakers, 40c.; truck drivers, 30c.; common laborers, 25 to 27½c.

Crushed slag for the surface treatment work in this section of Louisiana is shipped from Birmingham, Ala. At a siding a truck-mounted Universal



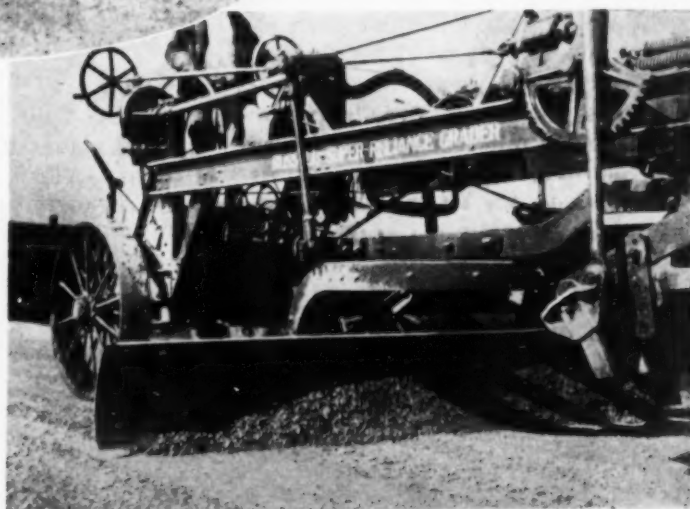
UNLOADING crushed slag at railway siding with clamshell bucket on Universal crane.

SHAPING UP shell road (right) with tractor-hauled grader before applying bituminous treatment.



OYSTER SHELLS (below), a plentiful local product, are widely used to surface roads.

DETAIL (below) of blade grading on shell road showing character of material after it has been crushed to fine size under traffic.

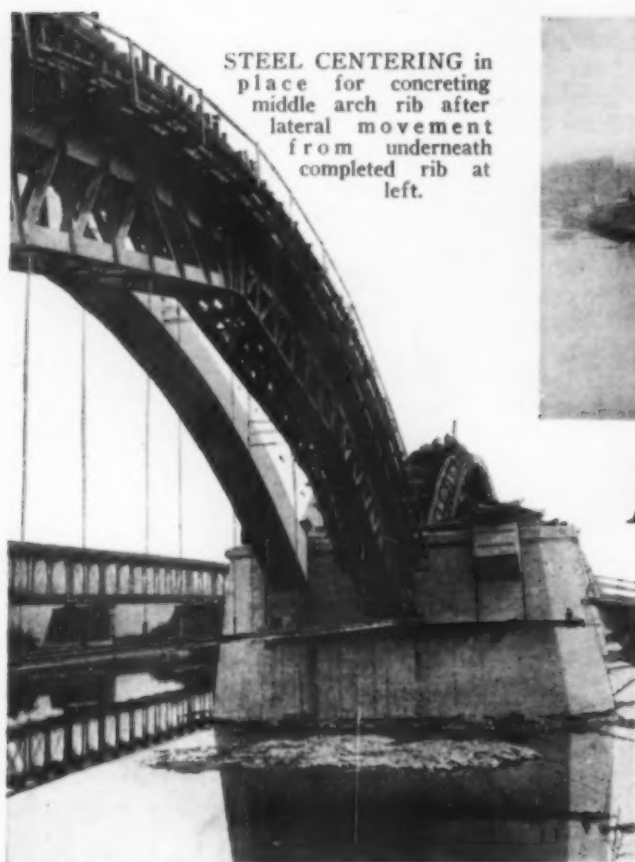


Russell blade grader hauled by a Bates 30 crawler tractor. As a preliminary to this work the surface must be wet down by a sprinkler outfit comprising a cylindrical tank mounted on the chassis of a Chevrolet motor truck. This road will first be primed with a hot application of 0.3 gal. per square yard covered by sweepings from the road and then it will receive 0.5 gal. of hot asphalt per square yard and from 40 to 50 lb. per square yard of

crane with clamshell bucket unloads the slag into light International motor trucks. The normal capacity of the bodies of these units is increased by the use of flareboards so that it is possible to haul from 2 to 3 yd. per load. The crane is able to unload about nine carloads of slag per day. The progress of the surface treatment operations depends upon a regular supply of asphalt and slag and to that end special attention has been paid to

organizing the work so as to insure prompt and adequate deliveries of materials.

The application of these bituminous surface treatments blazes a new highway trail in Louisiana and it is predicted that they will reduce maintenance costs to only a small fraction of the amount that was formerly being expended to replace and shape up regularly the gravel on the dusty, untreated roads.



STEEL CENTERING in place for concreting middle arch rib after lateral movement from underneath completed rib at left.



Huge, Steel ARCH CENTERS in Rapid Construction of Concrete Highway Susquehanna

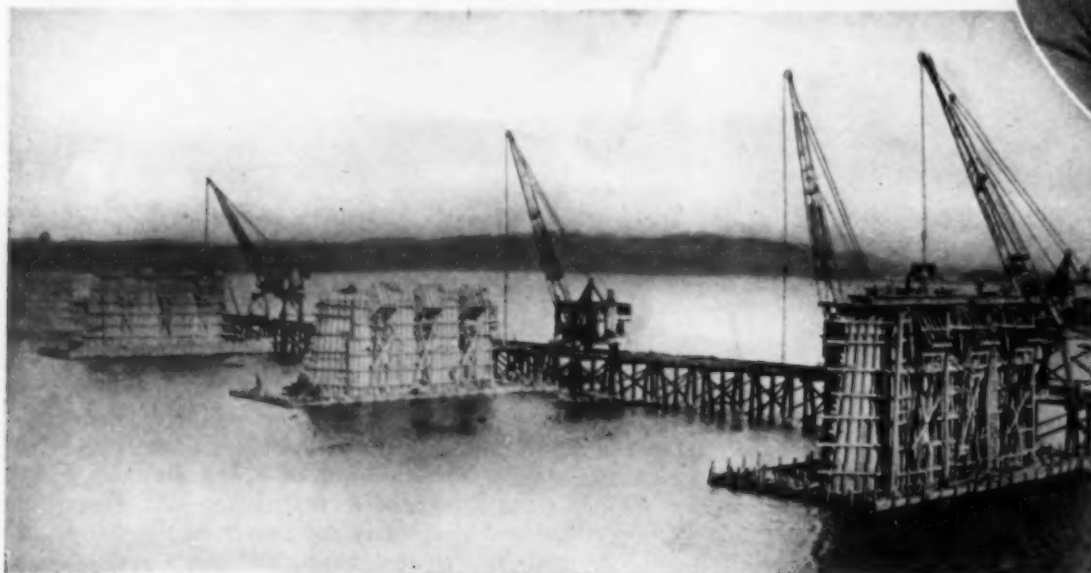
ORGANIZED for construction speed—with a penalty for failure to finish in 21 months and a bonus for earlier completion—the job of building the Columbia-Wrightsville (Pa.) intercounty highway toll bridge across the Susquehanna River, a \$2,500,000 multiple-arch concrete structure $1\frac{1}{2}$ miles long, is proceeding well ahead of scheduled progress, due to a carefully laid out construction plan, adequate equipment, an ingenious system of steel arch centering quickly set and moved and a program calling for construction by night as well as by day. An added

stimulus in maintaining the rapid construction pace is the progressive spirit which Glen M. Wiley and G. W. Maxon have injected into their newly formed partnership, the Wiley-Maxon Construction Co., of Dayton, Ohio, for which the Susquehanna River crossing, the longest multiple-arch concrete highway bridge in the world, is the organization's first big job.

General Features—Financed jointly by the counties of York and Lancaster, the bridge is 7,374 ft. long, with a 38-ft. roadway and 6-ft. sidewalk. It will constitute an important traffic link on U. S. Highway Route No. 30 be-



GLEN M. WILEY



RIVER PIERS (left) for bridge were built within cofferdams by cranes operating on construction trestle 5,600 ft. long.



TWENTY-EIGHT THREE-RIB ARCHES, each of 185-ft. span, form 1½-mile Susquehanna River crossing between Columbia and Wrightsville, Pa.

MOVED AS UNITS

48-Span Intercounty Bridge Across the River



CONCRETING one of the arch ribs, using 1-yd. bottom-dump bucket operated from 85-ft. boom of whirley crane.



G. W. MAXON

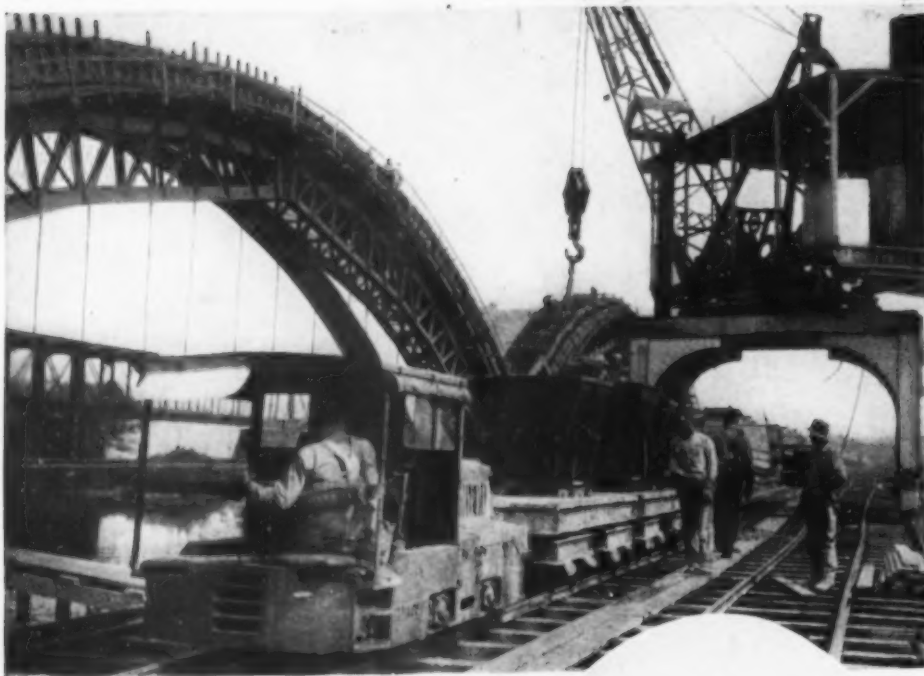
tween Philadelphia and Pittsburgh. At the point of crossing the river is 5,400 ft. wide. The design, prepared by James B. Long, consulting engineer of Norristown, Pa., for whom W. C. Fry is resident engineer, calls for the construction of a series of river piers of mass concrete to carry 28 three-rib reinforced concrete arches having clear spans of 185 ft., in addition to 20 girder spans of various shorter lengths for the land approaches. Each of the three ribs in every arch span is 7 ft. wide, 3 ft. 10 in. deep at the crown and 7 ft. deep at the haunches. The three ribs are tied together at five points in

each span by horizontal concrete struts. Vertical columns spaced 16 ft. 10 in. apart on centers, extend up from the arch ribs to support the floor system.

The Construction Plan—In planning the general scheme of construction a cableway was ruled out because of the great width of the river (more than a mile). A floating plant was eliminated on grounds of high cost, non-adaptability to the tall arch construction, and uncertain river conditions. The choice, therefore, narrowed down to a wood pile construction trestle extending a distance of 5,600 ft. across the river

ORIGINAL ERECTION (right) of steel arch centers, five for each half of bridge. On subsequent work centers were moved as units.





NO TRAFFIC DELAYS. Gantry mounting for Wiley whirley cranes on construction trestle provides 12-ft. clearance for passage of concrete cars hauled by industrial locomotives geared for speed of 18 miles per hour.

and parallel to the line of the bridge. It is designed to carry three sets of tracks—one of 18-ft. gage for a fleet of six traveling gantry cranes for concreting and form handling and a pair of 36-in. gage tracks for material haulage by industrial locomotive. With this equipment, as shown in one of the pictures, the narrow-gage locomotives and cars pass back and forth with a clearance of 12 ft. underneath the full-revolving gantry cranes, thus causing no interference between the hauling and the placing units of the contractor's plant. Without the underpass made possible by the overhead gantry mounting for the cranes, of course, the width of the trestle would have had to be considerably increased.

Another decided advantage of the trans-river construction trestle is that work on the bridge piers or arches can be carried on simultaneously at any number of points without interference or change in equipment. The whole plant layout is the result of a careful preliminary study of job traffic and material distribution.

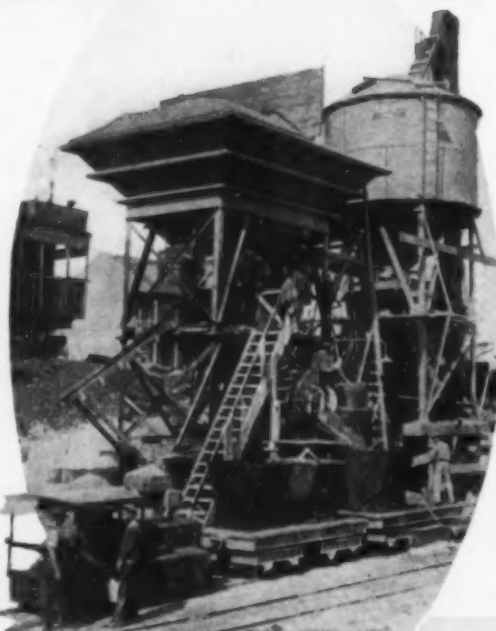
Plant Set-Ups—The decision to build from a construction trestle led naturally to the establishment of independent, but identical, plant set-ups on each side of the river serving two construction crews working out toward the center of the Susquehanna, first on the pier construction and later on the concreting of the arch ribs. Until all of the river piers were finished the job

was carried on, day and night, by two 11½-hour shifts. "Two competing jobs a mile apart and separated by a river," is the way Mr. Maxon describes the construction project.

Progress Schedule—A vital feature of the construction plan involves the completion of all river piers and 18 of the total number of 28 arches this season. With this end in view the contractor equipped himself with 10 sets of Blaw-Knox steel arch centering, 5 sets for each side of the river. With 9 arch spans concreted on each end of the bridge (or a total of 18 spans) before the arrival of winter it will be possible to set the steel centering for the remaining 10 spans, thus providing a continuous trafficway across the river and—an important point—permitting the dismantling of the construction trestle before ice forms in the river. With the trestle removed the plan is not to rebuild it next spring, but rather to handle the entire delivery and placing of material for the final 10 arches of the bridge from tracks laid along the tops of the arches already concreted and the steel arch centering placed to close the last gaps in the structure at the central portion of the bridge.

Equipment—The chief items of construction equipment, which, in the aggregate, amounts to about 10 per cent of the cost of the job, are as follows:

For Mixing Concrete—There are two identical mixing plants (one on each side of the river) for utilizing



CONCRETE MIXING PLANT (left) uses bulk cement delivered by motor truck and discharges into 1-yd. buckets on flat cars.

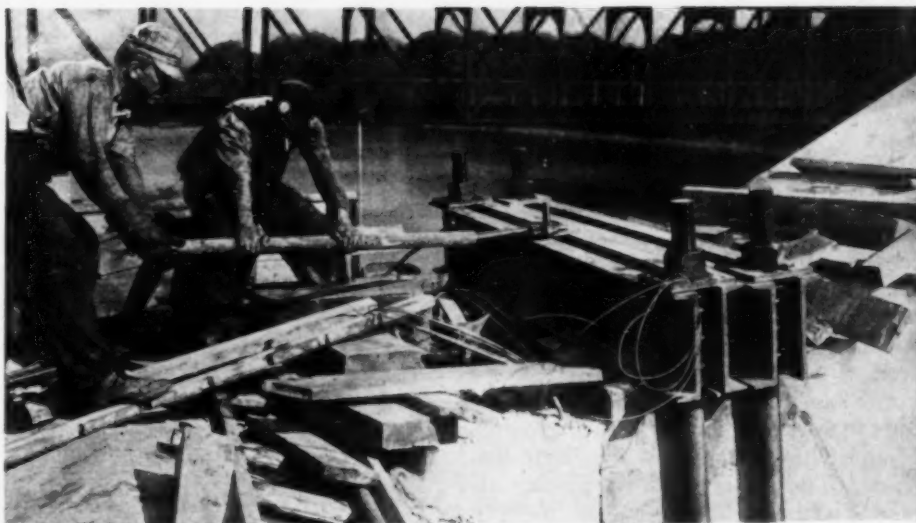


WOODEN ARCH FORMS are handled as built-up units by revolving crane, with 85-ft. boom, on construction trestle.

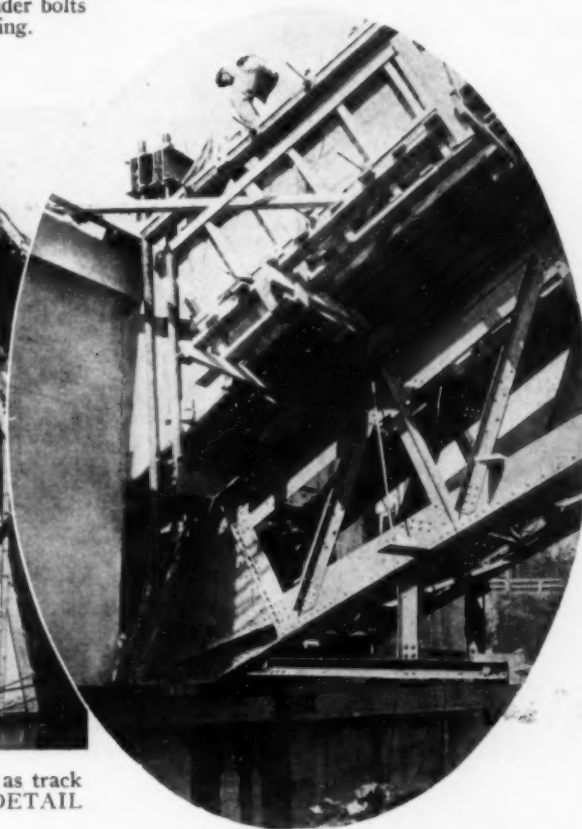
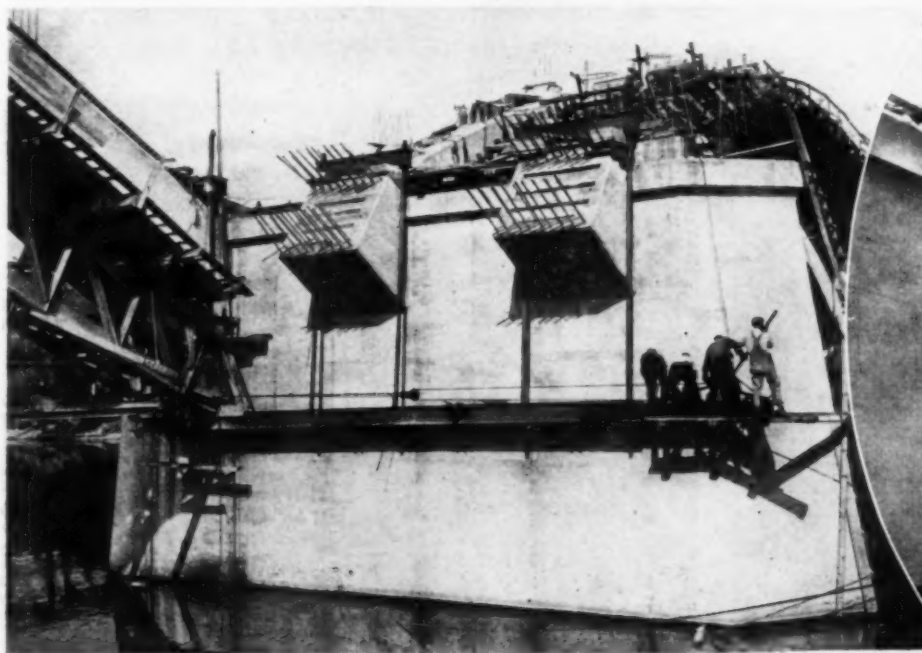
bulk cement. Each includes one 1-yd. Ransome mixer, electrically operated, Blaw-Knox elevated bins, inundators, volume batchers, weighing equipment and bulk cement storage bins served by Chain-Belt vertical bucket conveyors. One Wiley whirley crane with clam-shell bucket unloads sand and stone and one Ohio locomotive crane performs miscellaneous yard service.

For Transporting Concrete—Two identical groups of equipment (one on each side of the river) each include three 4½-ton Plymouth gasoline locomotives, Steubner 1-yd. bottom-dump concrete buckets and 8-wheel, 36-in. gage flat cars. The locomotives are specially geared for a speed of 18 miles per hour for quick transport of concrete along the long river trestle to the pier and arch forms.

For Material Handling—Six (3 for



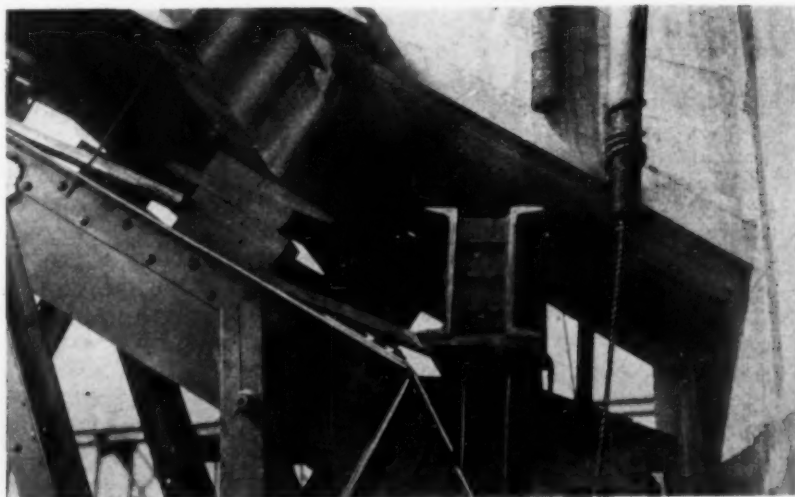
YOKE (above) of 15-in. channels on arch stub holds threaded suspender bolts carrying weight of centering.



BOTTOM GRILLAGE, hung by long bolts from yokes on arch stubs, serves as track for moving centering with aid of puller jack operated by men at right. DETAIL (in oval at right) shows method of centering support.



PULLER JACK, hooked to end of bottom grillage, moves centering along greased skidway.



READY TO MOVE. Threaded suspender rods are raised temporarily during lateral passage of centering to new position.

each half of the bridge) Wiley whirley steam-operated gantry cranes on 18-ft. gage trestle track, with 85-ft. booms, capable of handling 5-ton loads with flat boom, were installed. These machines serve a variety of purposes, including (1) erection of construction trestle; (2) erection of steel arch centering; (3) setting cofferdam cribs, removing excavation for river piers and concreting piers; (4) setting and stripping arch forms and concreting arch ribs with aid of bottom-dump buckets. Mr. Wiley, of the Wiley-Maxon organization, is the originator of the whirley machines that bear his name. The job involves the placing of approximately 100,000 cu.yd. of concrete.

At each end of the bridge there are the usual shops, including a carpenter

seals, formed the cofferdam walls. River pier construction to support the 28 arch spans proceeded at a rapid rate. During July, 9 river pier foundations and pier shafts, involving 13,000 cu.yd. of concrete were completed,

at the panel points. Side forms are placed as built-up units.

Support for the steel centering is afforded by vertical steel suspender bolts, $3\frac{1}{2}$ in. in diameter, threaded at their ends and hung from steel channel yokes seated on the tops of the concrete stubs of the arch ribs. Each steel center, with forms, weighs 100 tons.

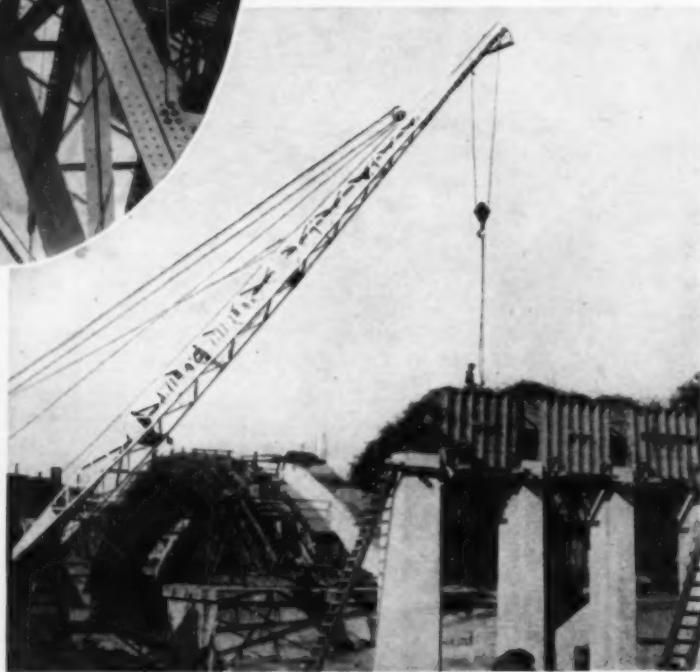
It will be noted in the photos that suspender bolts of two different lengths are used to carry the centering. The longer ones perform a dual function: During concreting they help the short suspender rods to support the weight of the centering and its load of concrete; during the moving of the forms, laterally, they carry at their lower ends a horizontal grillage of a pair of 15-in. channels, which, lubricated with grease, serves as a track



CONSTRUCTION TRESTLE, 5,600 ft. long, gives access to work at any point without interference.



STEEL TRUSSES (in oval) of centering before wood lagging for forms has been applied.



SETTING FORMS for approach piers to carry girder spans of various lengths.

shop for wood form work equipped with electrically operated band and circular cutoff saws. The job includes the use of about five million board feet of lumber for forms and trestle.

Speedy Construction—The construction contract for the Columbia-Wrightsville bridge was signed May 9, 1929. The contractors lost no time in getting the job started and the first concrete was poured June 12. The last river pier for the 28 arch spans was finished Sept. 14.

As the construction trestle was extended across the river by setting built-up timber bents with 12x12-in. posts, work started on the cofferdams for the concrete piers. Timber cribs, with clay fill and sand bag water

while in the following month that record was eclipsed by the completion of 13 river piers, involving 17,000 cu.yd. of concrete.

Steel Arch Centering—An outstanding feature of the job is the method and equipment for concreting the three-rib arches spanning the 185-ft. distances between pairs of river piers. As illustrated in the accompanying photographs, the centering, designed by the Blaw-Knox Co., Pittsburgh, is in the form of a pair of steel arch truss ribs with their footings tied together by a pair of horizontal steel tension members. Wood lagging serving as the bottom of the arch form is blocked up from the top members of the steel ribs

along which the footing of the steel center slides when shifted by puller jacks into position for concreting a new arch rib. The shorter suspender rods, with nuts and threads at both ends, help carry the weight of the centering except while a lateral move is being made.

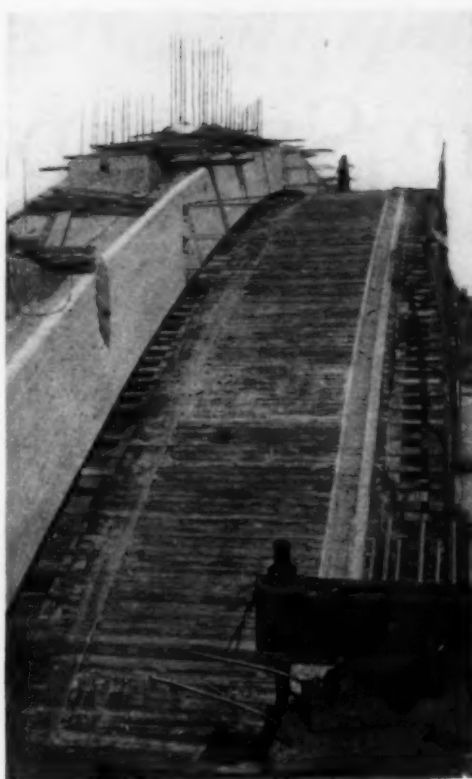
During a move of the centering along its grillage track after an arch rib has been concreted the suspender bolts in the path of its travel must be temporarily removed, the weight being handled by the other bolts. At such times the top yoke on the arch stub is held secure by a nut on a $1\frac{1}{2}$ -in. steel rod anchored deeply into the pier concrete.

Moving the Centering—Specifically

the several operations involved in lowering the forms and moving the steel arch center sideways to its new position are as follows: (1) With heavy Lowell ratchet wrench, start at top yoke to loosen nuts on long bolts, preparatory to allowing bottom track grillage to descend 2 in. (2) Test and tighten up on 1½-in. bolt anchoring top grillage to arch stub. (3) Complete 2-in. lowering of bottom grillage by loosening top nuts and remove the long bolt in the path of the lateral travel of the centering. (4) Loosen nuts on both short bolts (which now are carrying entire weight of centering) and let load of centering down upon bottom of track grillage. Then raise short bolts out of way. (5) Loosen wedges and remove concrete block in back of heel casting on centering. (6) Grease top of lower grillage and with Handy Andy puller jacks at each end move centering laterally into position for new concrete arch rib. (7) Replace all bolts and tighten up on nuts from top yolk to raise centering to position for new pour of concrete.

Concreting the Arch Ribs—Concrete for the arch ribs is deposited from 1-yd. bottom dump buckets picked off of the flat cars on the trestle and swung up over the forms by the Wiley whirley gantry cranes. Every fifth river pier of the bridge is an abutment pier so that with the steel centering placed for 5 ribs in line the thrust of the arches is taken care of.

To equalize the weight of the concrete as placed the concreting of each rib is done in six blocks, separated by keys. The sequence followed is first to concrete the pair of blocks nearest



COMING OUT FROM UNDER.
Lagging on arch centering has just cleared finished rib on journey to new set-up.

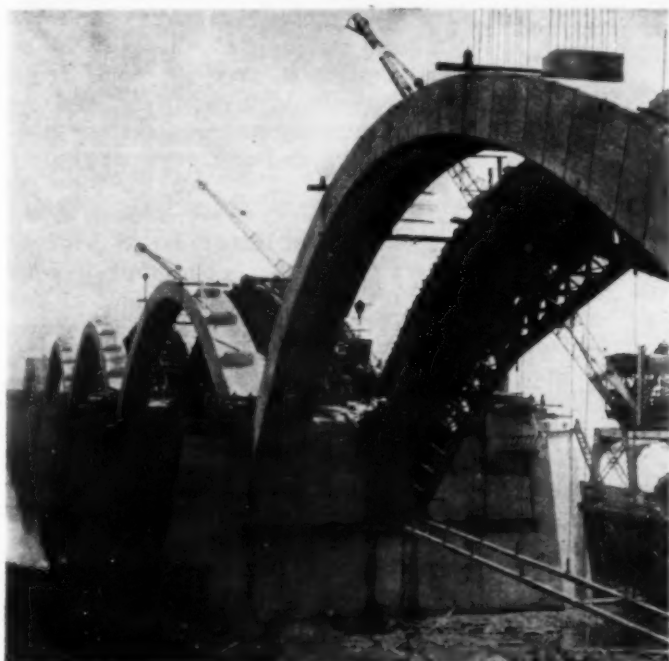
the haunches, next the pair at the crown and finally the pair between those in place. The order of concreting the seven keys is to start at the central or crown key and work in pairs, simultaneously, toward the haunches. Between the pouring of the blocks and the keys four days are allowed for shrinkage of the concrete. Arch forms are struck when tests of

the concrete show a strength of 2,000 lb. per square inch—generally in about 11 days. Side forms, however, are removed after 24 hours, cleaned, oiled and assembled for use again.

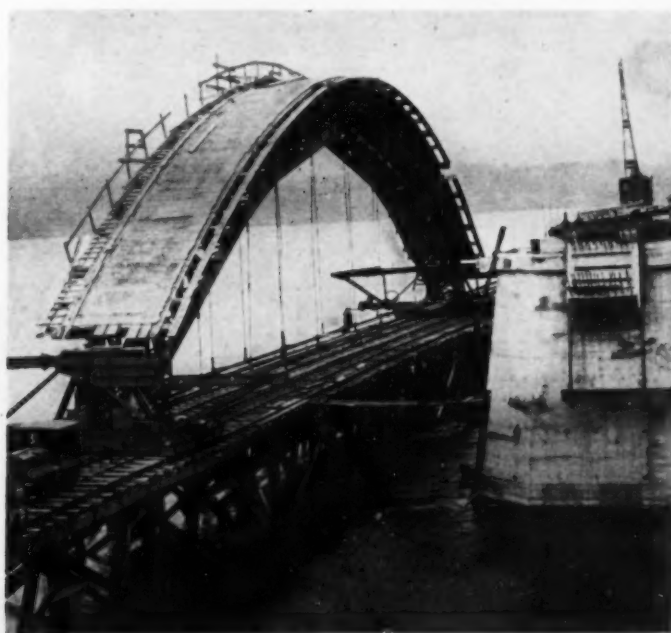
Bulk Cement—A detail of the concrete operations is the use of bulk cement. It is delivered to the two mixing plants by a fleet of International motor trucks equipped with special closed bodies holding from 35 to 42 bbl., which are loaded at the plant of the Sandusky Portland Cement Company at York, Pa., 11 miles distant from the job. Trucking proceeds day and night.

With the first five arch spans at each end of the bridge concreted, the steel centers are moved out on to the construction trestle, loaded on to special railway cars and hauled ahead to their new locations.

Job Organization—The job organization provides for a definite division of responsibilities between the two partners of the Wiley-Maxon Construction Co. Mr. Wiley supervises all outside construction operations, while Mr. Maxon handles matters of general administration, office management, purchase and delivery of equipment and materials. For the contractors the superintendents on each half of the bridge are Lee Wilson and Ward McNeal. H. P. Rule is in charge of erection and moving of the arch centering. F. R. Clement is responsible for material supply and distribution. At present rates of progress the Columbia-Wrightsville bridge will be finished well ahead of the specified completion date of Feb. 16, 1931.



ARCH RIB completed and steel centering moved laterally to position for concreting next rib.



IN TRANSIT. Steel arch center has been moved out upon construction trestle, ready for journey to new position on special flanged wheel railway trucks.

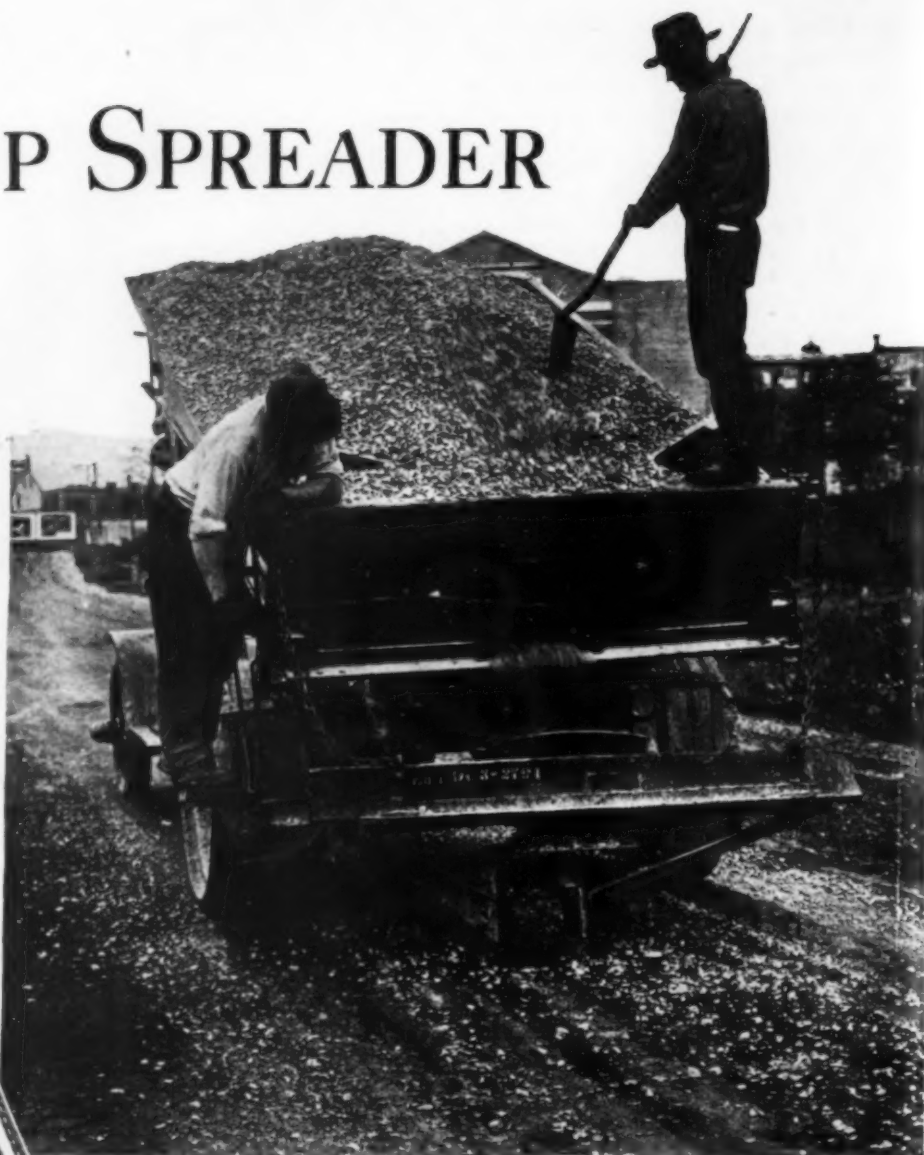
Pennsylvania's CHIP SPREADER

By W. A. VAN DUZER

*Assistant Chief Engineer,
Department of Highways,
Harrisburg, Pa.*

EXTENSIVE experiments carried on by the Pennsylvania Department of Highways to find the most economical method of applying chips on surface treatment have resulted in the adoption, as standard equipment for this operation, of a bucket loader and a spreading attachment hitched to a 5-ton dump truck.

Up to 1916 the Department applied chips by hand. This method resulted in considerable waste of material because small piles of stone had to be placed every 40 or 50 ft. along the highway. The labor cost also was high,



CHIP SPREADER IN ACTION (above). Labor cost is reduced to a minimum for this operation, only two men being required to unload the 5-ton truck. Two applications of chips complete the covering.



BUCKET LOADER (left), working from piles distributed along the road, loads a 5-ton truck in from 5 to 7 minutes. The loader operator and one laborer keep the trucks moving.

as gangs of from 25 to 30 laborers were required to place the chips. A horse-drawn chip spreader next was tried, but the wagons had to be loaded by hand and the chips placed in 10- or 15-ton piles to keep the hauls down to a minimum. This method, therefore, although an improvement both in quality of work and cost, was not entirely satisfactory.

With the bucket loader method, the chips are distributed along the road every mile or two in piles ranging from 100 to 200 tons. It is possible to load a 5-ton truck in from 5 to 7 minutes with one operator and one laborer, two laborers spreading the material.

The cost of treating from 2 to 3 miles of full-width surface (a day's work) by this method is about one-half the cost of the team hauling and spreading method and about one-third the cost of the hand method.

About 3 years ago the Department of Highways experimented in several ways of loading and spreading chips. The bucket loader and spreader attachment were found most economical.

WHEN SHOULD *Equipment* BE REPLACED?

A definition of "average annual cost of ownership" and a discussion of its application in determining when new equipment is justified to reduce production costs.

By a Highway Engineer

NOT long ago a contractor asked the writer, "How often should equipment be replaced?" He replied, "Just as often as the old equipment is worn out." To which the contractor rejoined: "But, really, when is equipment worn out?"

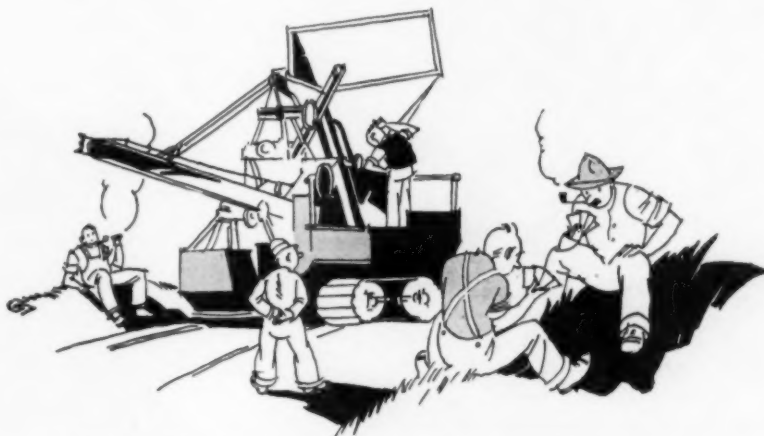
The answer to this question is so important to all contractors that it will be discussed in detail in this and a succeeding article in *Construction Methods*.

It is generally recognized that a machine is "worn out" whenever the cost

machine is a little less for each succeeding year. Later, however, it begins to rise—not much the first year, but rather sharply thereafter.

In applying average annual cost to determine when to replace any equipment the rule is: *Any equipment should be replaced as soon as there is the slightest evidence that the average annual cost of ownership is rising.* If this rule is rigidly applied it will come as a distinct surprise to most contrac-

such enterprise as the shoe factory does to the financial structure of the manufacturer of shoes. His money is invested in these things and his business is conducted for the purpose of making a profit on this investment. If the investor is fortunate, he obtains the profit; if not, he has a loss. But, whether he has a profit or a loss, he cannot properly include interest, because, in the first place, there is no certainty of any gain; and, in the



"If a cable breaks on the mixer the whole paving operation stops and production drops in proportion to the time lost."

"Any equipment should be replaced as soon as there is the slightest evidence that the 'average annual cost of ownership' is rising."

of continuing production with it is enough higher than the cost of producing with a new unit so that installing the new unit will increase the profit.

Average Annual Cost—Several methods of determining whether equipment has served its usefulness have been devised, but the safest and the simplest is the "average annual cost of ownership" method. This method involves only the process of setting up a memorandum account for each important piece of equipment—a card record any bookkeeper can handle is sufficient—entering on this record the first cost, and, each month thereafter, any proper charges for repairs, lost time, etc. At the end of each year the total cost of the machine is determined and the average annual cost of ownership is calculated.

It will be found that, for a period, the average annual cost of owning a

tors to find that much of their most expensive equipment cannot profitably be kept beyond the second or third construction season.

Interest—Interest on the investment in equipment should not be included in the calculation of the average annual cost of owning equipment. It is true that capital is invested in this equipment, but this is the capital invested in the enterprise as a whole, the capital on which an effort is being made to earn profits. As the objective is a profit on the enterprise as a whole and as the equipment represents part of the capital invested to that end, any charge for interest is out of place in this consideration of the subject.

Put in a little different way, the plant installed at a quarry or the equipment purchased by a paving contractor bear the same relation to the financial structures of men engaged in

second place, if there is any gain, it is the profit which he had in mind in making the investment.

Operating Expense—Neither are operating expenses to be charged against the equipment on which a cost record is kept. Operating expenses tend to increase a little as the age of the equipment increases, but as a factor in determining whether or not equipment is worn out, this increase is too small to be of great consequence. To try to obtain it introduces complexities out of proportion to the value of the information thus secured. It is best, therefore, to avoid operating expense as a factor in determining the average annual cost of owning equipment. There are other factors of much greater importance.

The purpose in determining the average annual cost of owning equipment is to avoid unnecessary equip-

ment expense. Excessive expense may be caused by the cost of repairs, but it is more likely to come from lack of dependability or from functional inadequacy. The full effect of the various causes of direct and indirect expense seldom is realized because it has never been the general practice to charge any but the more obvious costs—repairs, for instance—against the equipment. Costs resulting from a lack of dependability are more important and almost as tangible.

Cost records will show that a good deal of equipment is worn out in the sense that it begins to cost more to own it than it would to own new equipment, after not more than two seasons' work. They will also demonstrate the enormous value to the contractor of dependability and functional adequacy—the ability of primary equipment to produce without break-downs and, while producing, to work at the proper rate of output. These factors are vital in maintaining low equipment costs, but records, as now kept, seldom reveal their real relation to equipment costs. To many this statement may seem bizarre, but the fact remains that often the heaviest readily avoidable loss that contractors suffer is waste of time and effort caused by undependable and functionally inadequate equipment.

As a business man the contractor recognizes that it is of no consequence whether equipment is replaced every six months or every six years, if, as a result, the average annual cost of having this equipment is at the lowest possible figure. On the other hand, he is at a distinct disadvantage in this highly competitive field the moment the usual yearly cost of his equipment

"An important bolt breaks and half an hour is wasted in making repairs, but the men are paid for a full day."

exceeds that of his competitor. Therefore, whatever course of action keeps average equipment cost at the lowest point is the course of action to follow.

Repair Parts—The simplest analysis of the average cost of owning equipment takes into consideration only repair costs. To illustrate: A portable compressor has many moving parts and these wear both rapidly and unevenly. Repairs must be made from time to time and as the machine grows older there is a constant increase in the amount and the extent of these repairs. Such a machine can be kept in service indefinitely if it is repaired

skillfully and new parts are freely used, but to do so ultimately becomes expensive. It is the general practice of manufacturers to list parts on such a basis that if a machine were to be assembled out of parts the parts alone would cost more than a new machine. Moreover, mechanics ordinarily available in the field are not as familiar with the technique of assembly as those who give their whole time to such work. The labor involved in field assembly, therefore, is greater than that involved

"The full effect of the various causes of direct and indirect expense seldom is realized because it has never been the general practice to charge any but the more obvious costs against the equipment."

in factory assembly. In addition to these considerations, which apply generally to field repairs, there must be included the cost of dismantling. If, then, to the original cost of the equipment is added for each year (in practice it should be booked each month) the cost of repairs and replacements, a condition of this sort develops:

Original cost of machine.....	\$3,000
Repairs during first year.....	200
Total cost to date.....	3,200
Average annual cost of ownership if abandoned end 1st year.....	\$3,200
Repairs during second year.....	600
Total cost to date.....	3,800
Average annual cost of ownership if abandoned at the end of the second year.....	\$1,900
Repairs and replacements, third year.....	1,000
Total cost to date.....	4,800
Average annual cost of ownership if abandoned at the end of the third year.....	\$1,600
Repair and replacements, fourth year.....	1,400
Total cost to date.....	6,200
Average annual cost of ownership if abandoned end 4th year.....	\$1,550
Repairs and replacements, fifth year.....	1,800
Total cost to date.....	8,000
Average annual cost of ownership if abandoned end 5th year.....	\$1,600

Trade-In and Junk Value—It is apparent, in this case, that if only the cost of repairs is considered, the minimum average annual cost of ownership is reached by abandonment at the end of about the fourth year of service. This case is purely hypothetical, but the process of analysis is applicable to any type of equipment which is without material trade-in or junk value, though for reasons which will appear later, an analysis of this sort generally indicates a useful life which is beyond the actual useful life.

There is a great deal of equipment which is literally abandoned when it is worn out. It has little or no trade-in value or junk value. On the other

hand, there is equipment which has a material trade-in value or a junk value, and where such is the case a somewhat different situation is created.

Suppose, as an illustration of this condition, that the above equipment had a trade-in value of \$1,500 at the end of the first year, a trade-in value of \$750 at the end of the second year, and a junk value of \$200 at the end of the third and subsequent years. The following conditions would then result:

Cost.....	\$3,000
Repairs, first year.....	200
Total cost at end of first year.....	\$3,200
Less trade-in value.....	1,500
Average annual cost if traded in at the end of the first year.....	1,700
Repairs, second year.....	600
Total cost at end of second year.....	\$3,800
Less trade-in value.....	750
Average annual cost if traded in at end of the second year.....	1,525
Repairs, third year.....	1,000
Total cost at end of third year.....	4,800
Less junk value.....	200
Average annual cost if traded in at end of the third year.....	1,533

It is apparent that where such a condition as this prevails it is desirable to obtain new equipment after the second or, in any even, not later than after the third working season. This may seem to be a startling statement, but the facts warrant it.

There is a good deal of construction equipment today on which high trade-in values are allowed. Repair costs mount rapidly after the first year of operation. The practical, as well as the theoretical, result is to create a condition in which, wholly aside from other conditions to be discussed later, it is advisable to replace such equipment rather frequently. Mixers are a good example. Trucks can often be

"Shut-downs involve a whole series of intangible expenses such as the loss of trained men, the cost of obtaining new men, lowered production."

disposed of to better advantage when they are relatively new. Cranes, shovels and similar heavy equipment have early trade-in values which are so high that on the basis of the average annual cost of ownership alone it is often cheaper to make an exchange after a comparatively short service than to attempt any other course.

Dependability—Most construction jobs involve a series of operations which are based on the production of some one piece of equipment. This fact divides construction equipment into two classes: Primary equipment

or equipment on which a productive process is based; and secondary equipment, or that used in subordinate processes.

Often the valuable life of primary equipment is shorter than a determination on the basis previously discussed would indicate. Therefore, while a calculation of the valuable life based on repair costs and trade-in or junk values is fairly satisfactory in the case of secondary equipment, because neither dependability nor functional adequacy are as likely to influence the annual cost of owning secondary equipment as they do the valuable life of primary equipment, a more extended study of costs is essential in the case of primary equipment.

The general plan of plant operation on construction work is to pass materials from one process to another until the materials reach their final position. The series of operations may be a long one, as it is on a concrete paving job where materials are moved from the cars to the hoppers, from the hoppers to the trucks; are hauled to the mixer, emptied into the mixer, mixed; dumped upon the subgrade, spread and finished in a steady stream from morning till night. On the other hand, the series may be short. In any event, whatever interferes with the steady flow of materials from stock to finished work increases cost. This is innate in the relationship $K = O/P$, where K is unit cost, O is daily operating cost and P is daily production. This is the usual relationship on construction work, for any interruption which reduces P (the production) without reducing O (the daily operation), necessarily increases K (the unit production cost).

Lost Time—Take as a random illustration a crusher breaking stone at a quarry. An important bolt breaks and half an hour is wasted in making repairs. The production for the day, P , is reduced by this breakdown just about in the same proportion the time involved in making repairs bears to the length of the working day. But, as a general rule, the men are paid for the full day. On most construction work the same conditions prevail. If a cable breaks on the mixer, the whole paving operation stops and production drops about in proportion to the time lost. The men putter around while the mixer is being repaired, doing nothing much of value, but, as a rule, they are paid for a full day's work. Again, unit-cost (not including materials) is

increased in about the same proportion that time is lost.

On a concrete paving job the idle time payroll usually runs between \$50 and \$100 a day. The policy as to the number of full-time men employed varies from job to job, but whether the number is large or small, the general effect always is the same—to make the actual expense of breakdowns a good deal higher than the direct cost of repairs, for whatever unproductive labor cost is incurred as a whole while breakdowns are being repaired is a proper charge against the equipment involved.

Cost-accounting practices generally do not correctly reflect the effect of lost time on the expense, for such costs are not charged against the equipment

throughout the series. All such equipment should, therefore, be replaced often enough to insure a high degree of dependability.

Intangible Expenses—The value of dependability extends even further than the matter of direct costs plus payroll expenses during shut-downs for repairs. If the analysis were carried into the less tangible fields it would appear that shut-downs involve a whole series of intangible expenses, such as the loss of trained men who, if there are many shut-downs, leave to find more steady employment; the cost of obtaining new men; the lowered production which follows any shut-downs of a day or longer because the men have lost their stride and have to pick it up again.

Then, too, the development of a smooth-running organization capable of securing consistently high production is seldom attained except where conditions permit of steady operation day after day. Repeated breakdowns so tend to prevent the perfection of the organization that a high rate of production is not likely to be reached at all. There have been instances where replacing worn-out equipment with highly dependable new equipment have added more than 50 per cent to the average daily output, the larger part of which was due to no other apparent reason than that the greater dependability of the new equipment enabled the contractor to develop a better organization.

The exact value of items of this sort is not readily calculable, but all of them tend to lay added emphasis on the deduction already made—that dependability is of such importance and the lack of it so expensive that any equipment which is so related to a series of production operations that breakdowns will stop production, should never be allowed to reach a condition of impaired dependability.

Under the conditions prevailing at the moment, this requires the exchange of many kinds of old equipment after from one to two years of service. It is difficult to believe that the high trade-in values on which the propriety of such a course of action now, at least to some extent, rests, will prevail. But whether they do or not, the fact would still remain that dependability is of outstanding importance in determining the valuable life of equipment, for any lack of dependability, that is, any tendency toward frequent breakdowns, stop production on the job as a whole.

(To Be Concluded)



"Excessive expense may be caused by the cost of repairs—but is more likely to come from lack of dependability or functional inadequacy."

at fault. If these costs were properly charged, this situation would at once appear:

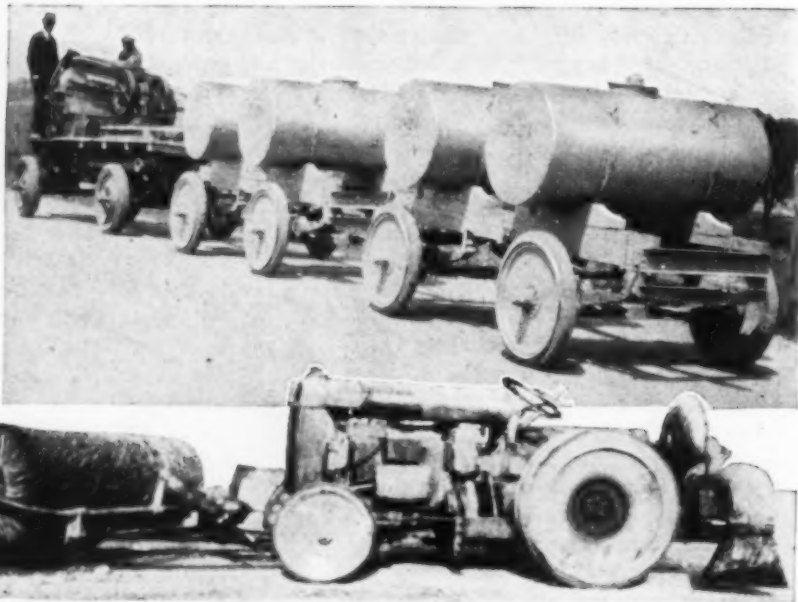
Equipment	
First cost	\$8,000
Repairs, first year	150
Payroll during delays caused by breakdowns	150
Total cost	8,300
Trade-in value	3,000
Annual cost of ownership if traded in at end of first year	\$5,300
Repairs, second year	500
Payroll during delays caused by breakdowns	1,000
Total	9,800
Less trade-in value	1,500
Net	8,300
Average annual cost of ownership if traded in end 2nd year	\$4,150
Repairs, third year	1,500
Payroll during delays caused by breakdowns	2,500
Total	13,800
Less trade-in value	500
Net	13,300
Average annual cost of ownership if traded in end 3rd year	\$4,433

The figures given are hypothetical, but they illustrate the fact that reduction in dependability, which is a definite attribute of age, tends sharply to increase the cost of owning any piece of equipment that is so related to a series of expensive operations that a breakdown will stop production

Getting Down to HIGHWAY DETAILS



HAND CONTAINER spreads Tarvia for hot penetration patch.



TO SWEEP AND BLOW Virginia state roadways clean before surface treatment. TANKS ON TRAILERS (above) haul bituminous materials.

Photos from J. J. FORRER, Assistant Engineer, Maintenance, Department of Highways, Richmond, Va.



DISTRIBUTOR PRODUCES OWN EMULSIFIED ASPHALT (left) by applying water from separate tank and spray bar immediately ahead of hot oil spray. Immediate emulsion formed covers stone about same as 50 per cent water - emulsified oils. Oregon State Highway Commission finds that this method gives excellent seal and requires smaller amount of oil in proportion to rock. TRUCK (in circle), equipped with spreader box, backs over freshly oiled surface to spread stone.

Photos from R. H. BALDOCK, Maintenance Engineer, Oregon State Highway Comm., Salem, Ore.



HAND PATCHING with one of Atlantic Refining Co.'s distributors.



TRUCK MOUNTING for bucket loader increases portability of Montana Highway Department machine.

Photo from R. D. RADER, Chief Engineer, State Highway Dept., Helena, Mont.

Close-up Shots of
Methods and Equipment
Used in Maintenance
and Construction



MOTOR-DRIVEN DERRICK, with swing boom, mounted on trailer pulled by truck, loads heavy rolls of snow fence for Wisconsin Highway Commission. Device designed by George J. Cormier, Brown County highway commissioner.

Photo from WILLIAM HOENIG, Maintenance Engineer, Wisconsin Highway Comm., Madison, Wis.



LATEST-TYPE PAVEMENT MARKER, built by Illinois Highway Department, paints 25 miles of asphalt traffic line in one day. (In oval) **ASPHALT NOZZLE** and accessory equipment.

Photos from FRED TARRANT, Engineer of Maintenance, Division of Highways, Springfield, Ill.

ASPHALT FILLER (right) for brick pavement is applied hot through hose from distributor. Crew of five men (truck driver, nozzle-man, and three squeegee men) pour 2,100 gal. per day—sufficient to fill about 1,600 sq.yd.



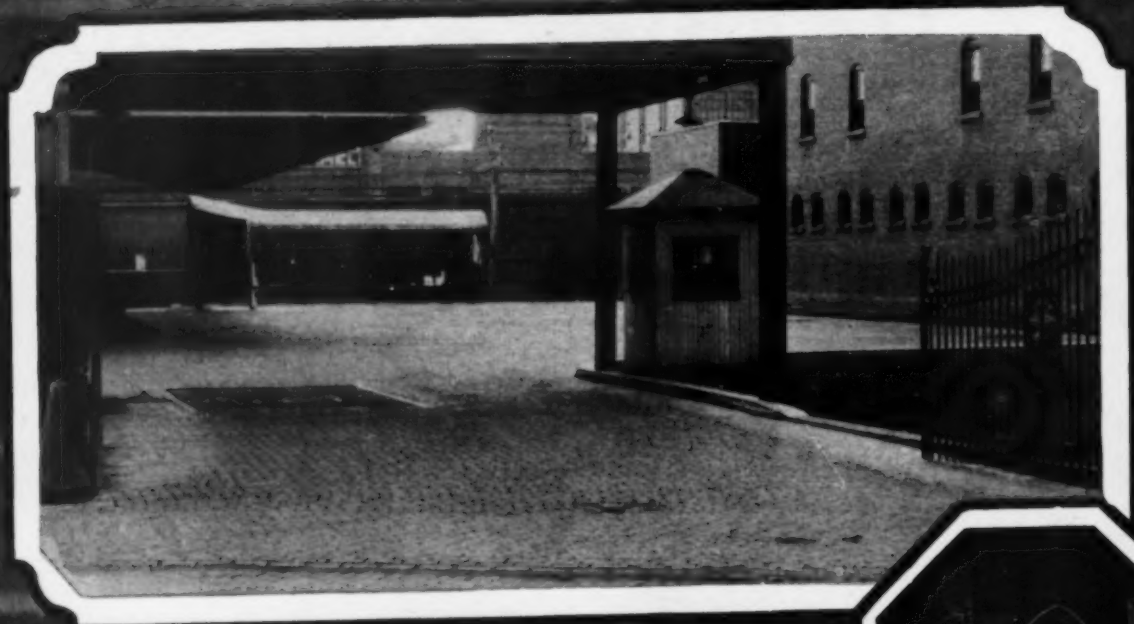
SPREADER BOX, maintaining shoulders of heavily traveled Indiana state highways, controls depth of loose aggregate applied to shoulder by means of trap door.

Photo from A. H. HINKLE, Superintendent of Maintenance, State Highway Comm., Indianapolis, Ind.

SAND AND GRAVEL PLANT (below) on contract section of Washington state route 10. Aggregates, sluiced from pit into chute, separate into stock piles at lower end of chute.

Photo from SAMUEL J. HUMES, Director of Highways, Department of Highways, Olympia, Wash.





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BRICK

stands the "Gaff" of Industrial Service

Vitrified Paving Brick is ideal for the Industrial plant. It is designed and fired to stand the crash—jolt—and grind to which it is subjected in the shipping yard.

Nothing combines the long life qualities of brick for this kind of service. No rutting, no dusting, no crumbling, no action under acids, no absorption of oil, grease or water, lower maintenance and higher salvage value, are features common to vitrified brick not found in other materials.

Metropolitan, Bessemer and Olean—three brands known to represent exceptionally high quality—are serving many industries faithfully as well as public officials in communities where brick pavements abound.

Specify any of the three brands named if you want the utmost in brick quality from America's largest producers of paving brick.

METROPOLITAN PAVING BRICK COMPANY
CANTON OHIO





END DUMPING from trucks pushes fill across arm of San Francisco Bay. Weight of fill causes displacement of surrounding marsh, which can be seen upheaving on this side of fill.

Road Builder

MOVES 1,000,000 YARDS

on 3½-Mile California Job

CUTTING through the hills between San Francisco and South San Francisco, the H. W. Rohl Co. moved approximately 1,000,000 cu.yd. of earth excavation on a 3½-mile section of the Bayshore Highway, which provides a second traffic outlet from the city down the peninsula to San Jose. This section is regarded as the heaviest grading contract awarded by the California Highway Commission.

The new highway, which has a mini-

plicating factor in the organization and planning of the entire job.

The unit price of the H. W. Rohl Co., which offered the lowest bid of nineteen received by the Division of Highways on Aug. 1, 1928, was 48c. per cubic yard. Original plans called for 805,000 cu.yd. of excavation, but, on the expectation of slides, it was

estimated from the start that the total yardage to be handled would be near 1,000,000. By Sept. 20, 1929, when work was completed except for cleaning up some slide material, excavation amounted to 955,000 cu.yd.

Three Northwest shovels, 1½ and 1-yd. capacity, two P&H shovels, 1½ and 1½-yd. capacity, and two Northwest cranes did the digging, with the aid of extensive drilling and shooting at some points. Seventeen Sterling trucks equipped with steel bodies and hydraulic hoists hauled the spoil to the fills, where it was spread by Caterpillar tractors with McMillan hydraulic bulldozers. The tractor-bulldozers also cleaned up the cuts. During the period of heavy construction, two shifts a day were employed.



TRUCKS AND BULLDOZERS (left) spread fill in layers to be compacted. SIERRA POINT CUT (below), 180 ft. deep on the high side, required more than 400,000 yd. of excavation.

mum width of 60 ft. and a limiting grade of 4 per cent, improves the alignment of the former route by using six long radius curves to eliminate about 30 sharp turns. A temporary surface 40 ft. wide, to take care of traffic until the fills shall have become stable, was built up of an 8-in. water-bound macadam base and a 2-in. bituminous macadam top. The surface was laid in two 20-ft. strips to permit passage of traffic during construction. Need of keeping traffic moving at all stages of the work was a serious com-



Fills were built up in layers according to specification. The largest fill, more than 50 ft. high, crossing a small arm of San Francisco Bay, had to be placed on soft mud bottom. Here the contractor resorted to end dumping to build up the foundation but placed the upper portion in layers. The high fill caused displacements of the surrounding marsh extending, in extreme cases, more than 300 ft. beyond the toe of the slope, and drops of 8 to 15 ft. in a short time were common experiences.

All cuts have a bottom width of 64 ft. The largest cut (more than 400,000 yd.) was at Sierra Point, directly over a Southern Pacific tunnel through the hill which rises abruptly out of the

HYDRAULIC BULLDOZER, mounted on tractor, distributes spoil dumped on fill.

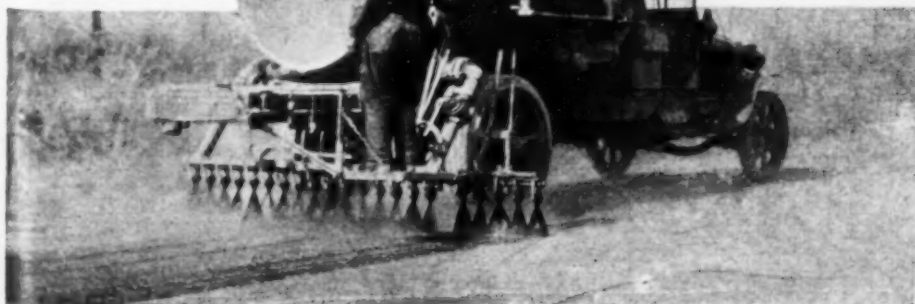


TRACTOR WITH BULLDOZER cleans floor of cut to facilitate movement of trucks loaded by two shovels.

bay. Maximum depth of this cut, measured vertically from grade to edge of cut on uphill side, is 180 ft. Because of its great depth, this cut was finished on a $1\frac{1}{2}$:1 slope from a point about 30 ft. above grade, instead of on the usual 1:1 slope from grade to top of bank.

The road is hemmed in on one side

TOP COURSE, also constructed in half widths, consists of 2-in. thickness of bituminous macadam.



by the Southern Pacific tracks and on the other by the Spring Valley 44-in. water main supplying San Francisco's downtown and industrial district. Approximately \$150,000 was spent in moving this pipe line at various places to clear the right-of-way. A massive rubble retaining wall more than 300 ft. long, 24 ft. in height above grade and an equal distance in depth below grade, had to be constructed across the face of an old slide area to hold the pipe line above the roadway.

B. F. Wells was general superintendent for the contractor. H. S. Pay-



BASE COURSE of water-bound macadam is constructed over half of 40-ft. width at a time, other half being left open for traffic. Portion of half-width base has received application of asphaltic binder.

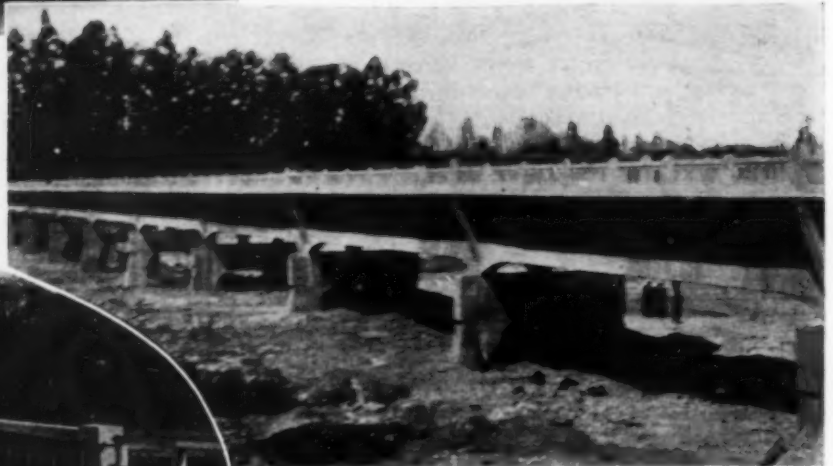
son, resident engineer, supervised construction under the direction of J. H. Skeggs, district engineer for District 4 of the California Division of Highways, of which C. H. Powell is chief engineer.

HIGHWAY

*Examples of Structures
in Many Parts of*



RUSTIC BRIDGE utilizes available material on U. S. forest lands.



CONCRETE GIRDER SPANS carry one of national highways near Santiago, Chile, over dry river bed, flooded only in rainy season.

*Photo from FREDERIC A. REIMER,
President, American Road Builders' Association.*



BRICK HAND-RAIL of pleasing design enhances appearance of concrete bridge on federal aid project in Illinois.



CONTINUOUS TRUSS BRIDGE of type used in Oregon. **FLEXIBLE STEEL SUPPORT** (left) of concrete girder bridge in Wyoming provides for temperature movements. Three steel pedestals at each end consist of angles and web plate which extends into concrete, providing for movement by its flexibility. **HIGHWAY PASSES ABOVE RAILROAD BRIDGE** (below) on steel arch, with concrete arch approaches, over Charles River, Boston.



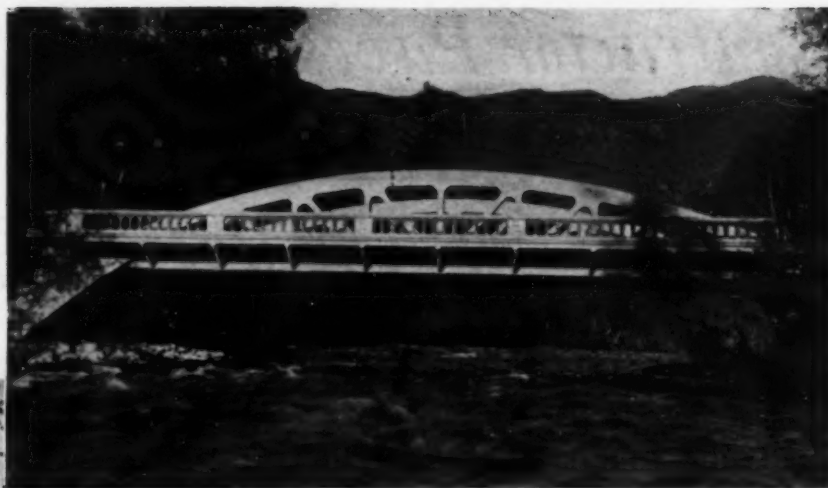
*All photos on this page (except that of Chilean bridge) from
ALBIN L. GEMENY
Senior Structural Engineer, Bureau of Public Roads,
Washington, D. C.*



BRIDGES

Adapted to Local Conditions

This Hemisphere



PONY TRUSSES, encased in concrete and supported on corbels, carry Oregon state highway over McKenzie River. Further description of this bridge will appear in future issue. RIGID FRAME CONSTRUCTION (left) is used in this reinforced-concrete girder bridge, 200 ft. long, without an expansion joint.

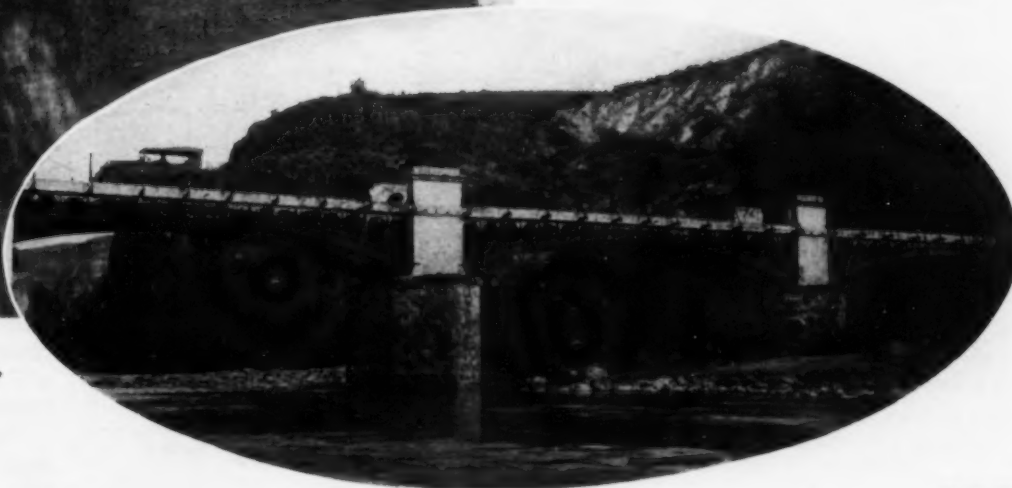


*These two photos from
C. B. McCULLOUGH, Bridge Engineer,
Oregon State Highway Commission,
Salem, Ore.*

DECK CONSTRUCTION (right) under way on bridge south of Monterey, Mexico City-Laredo, Tex., highway.



TALL CONCRETE PIERS, steel trusses, and steel deck girder spans make up bridge over Salado River on Mexico City-Laredo, Tex., road. (Below) TULA RIVER BRIDGE on same highway.



*Photos from OCTAVIO DUBOIS
President, National Highway Commission,
Mexico City, Mexico*

Contractor Paves

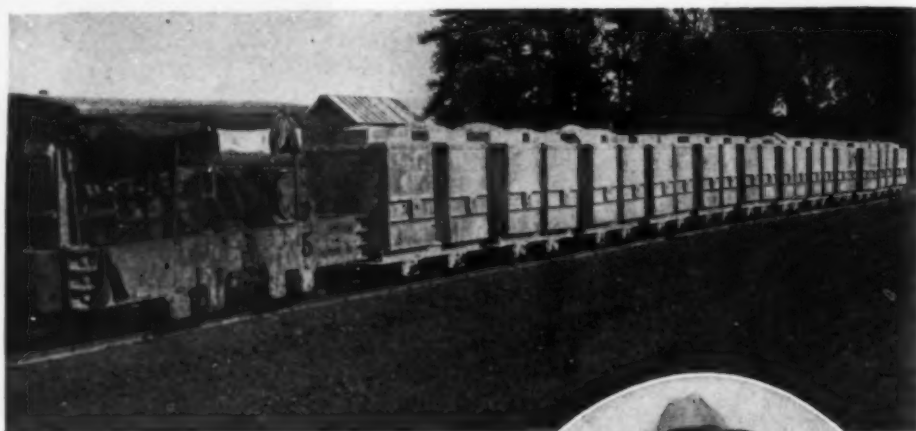
21 MILES IN 4 $\frac{2}{3}$ MONTHS

by Keeping the Trains Moving

TO lay 21.3 miles of 9-6-9-in. slab 18 ft. wide with a 1-yd. mixer outfit in a single season requires an organization of more than ordinary efficiency. Years of experience fitted J. C. O'Connor & Sons, Inc., Fort Wayne, Ind., to undertake a contract of this length confidently and to complete it swiftly, the last foot of slab being laid on Aug. 31, more than two months before the end of the season. The pavement was built for the state of Illinois on route 169, from Dalton City to Shelbyville.

Plant Locations—Standard industrial railway equipment, a new Koehring 27-E paver and a material-handling plant of average capacity were the major items of equipment used in performing the work. The mixer started at Dalton City, the northern terminus of the job, and ran south to Shelbyville. All materials were shipped in by rail. Three possible locations for the material-handling plant were available, one at each end of the job and one 6 $\frac{1}{2}$ miles north of Shelbyville. The contractor chose Dalton City for the first set-up and the intermediate location for the second.

Recognizing the fact that transpor-



INDUSTRIAL RAILWAY, hauling over well-laid track on solid roadbed, and careful grading finished miles in advance of mixer are two important factors in rapid progress of work.

tation of material to the mixer is the factor limiting production on most concrete paving jobs, the contractor organized the industrial railway system to operate in conformity with the well-established precept of all successful railroad operation, "Keep the trains moving." Assuming a maximum capacity for the mixer, the transportation system and the material-handling plant



M. P. O'CONNOR, vice-president of J. C. O'Connor & Sons, Inc., keeps an eye on operations, with aid of BATCH BOX, official job mascot.



SUB-CONTRACTOR HANDLES CEMENT on sack-price basis. Sacks are trucked out of cars and stacked on platform, preparatory to loading into cement compartments of batch boxes.

were planned to deliver cement and dry aggregate to the mixer at the required rate, allowance being made, of course, for slight variation in operating schedules of the two supply units. Both railway and material-handling plant were equipped from stocks already on hand.

Railway Equipment—Industrial railway equipment included 9.2 miles of Lakewood 24-in. gage track (7.7 miles of 20-lb. rail and 1.5 miles of 25-lb.), 110 Lakewood flat cars, 220 Lakewood steel batch boxes, and eight gasoline locomotives (two Midwest 7-ton, four Burton 6-ton, one Whitcomb 4-ton, and one Burton 3-ton). The batch boxes, having a designed capacity of 37 cu.ft., were built up with a 7-in. riser to hold 42 cu.ft. Two batch boxes were hauled on each car.

The material-handling plant was equipped with a Blaw-Knox 72-ton



CRANE LIFTS AGGREGATES from pits to stock piles or to bins over batch hoppers on opposite side of track. PITS (right), 8 ft. deep, are lined with concrete to 6 in. above water table.



steel bin having two batchers and a Northwest gasoline crane operating a 1-yd. bucket on a 50-ft. boom. Aggregates were dumped from hopper bottom cars into pits beneath the track, whence they were transferred by the crane either to the bins or to stock piles. The pits were 12x12x8 ft. deep.

Cement was handled by a sub-contractor on a unit price basis. After the batch boxes had been charged with sand and stone, cement was loaded from a platform between the industrial track and the box cars containing the sacked cement. Six bags were required for one batch of the 1:2:3½ mix. A six-man crew loaded a 24-batch train from piles stacked in readiness on the platform in about 3½ minutes.

Railway Operation—Concerning the importance of the industrial railway operation, M. P. O'Connor, vice-president of the contracting concern, has this to say: "During the first 2 months of our work—from April 11 to June 15—the country in which we were operating had the heaviest rainfall on record, about 16 in. (as against a normal yearly precipitation of 36 in.), more than 50 per cent above normal for this period. Because we had taken care in advance to provide drainage and to lay track, we were able to operate with fair success and to complete 8.2 miles of pavement. Had we been using trucks, I can say without

exaggeration, taking into consideration the length of our haul, that we should not have been able to complete a mile of pavement during this period, and the excellent weather of the balance of the season would have been consumed in paying the losses sustained in the first 2-month period."

Railway operation was planned to eliminate a number of wasteful conditions. The contractor prepared a smooth, firm roadbed and laid the rail to fixed line and grade. Train schedules were so arranged that loaded trains traveled at moderate speeds, thus saving wear on the locomotive bearings. Furthermore, the schedule and the spacing of passing tracks were coordinated to eliminate as far as possible time lost in waiting at the switches.

Locomotives pulled both loaded and empty trains, experience having taught the contractor that fewer derailments occur when the dinkies pull, rather than push, the cars. A minor exception to this rule was permitted in the movement of empty trains. Each loaded train dropped two cars at the mixer and then moved ahead to make the switch, the locomotive placing the

loaded cars on the switch track and picking up a train of empty cars. As it came out after completing the switch, the locomotive pushed ahead of it the two cars previously dropped at the mixer.

Operating on Long Haul—Mr. O'Connor outlines the system of railway operation on a long haul as follows: "Our best and, what I consider, our most efficient day as to haulage was one on which we laid 1,543 ft. of pavement in 13 hours, hauling 7.6 miles. [Much higher paving records than this were made on shorter hauls, as will be noted later—Ed.] At this time we were using trains of 14 cars pulled by the larger locomotives. The 4-ton Whitcomb was stationed at the yard, loading trains and delivering them to a storage track just outside the yard. Four large engines were used on the road haul, delivering trains from the yard storage track to another storage track about 1 mile from the mixer. Two locomotives hauled from this track to the mixer. The 3-ton Burton acted as a pusher on a long grade that was giving us some trouble, thus enabling us to keep our trains heavily loaded.

"This method obviated delays of the road haul engines both at the plant and at the storage track behind the mixer, as these locomotives nearly always found loaded trains at the plant and empty trains at the storage track awaiting them. As our hauls grew shorter, naturally we had surplus equipment in daily increasing quantity, and the problem of mixer supply was made easier."

Railway Organization—As further



SPRAYER of Hudson Manufacturing Co. enables workman to apply oil to 100 lin.ft. of forms per minute. Air pressure is pumped up as needed.



HOLLOW STEEL BULKHEAD forms 4-in. joint in slab at intervals of 800 to 1,000 ft. and at bridge approaches. Workmen are lowering subgrade for thickened, reinforced slab at bridge approach.

reason for the success of the transportation unit, Mr. O'Connor cites its organization and maintenance methods: "Glenn Harrell, in charge of transportation under Paving Superintendent William Dressel, has been with us for 8 years. He thoroughly understands the repair and maintenance of the motors, and he is perfectly familiar with their weak points. Mr. Harrell ranged up and down the track, paying strict attention to the movement of the trains and especially to any delays that occurred at the switching or passing tracks. He was responsible for the spacing of the switches to avoid delays and to keep the trains moving. Switches were re-arranged from time to time to accomplish these ends. Only empty trains were run upon the switches, except in case of emergency, and, each day, hauling was continued until a loaded and an empty train were waiting at each switch to guarantee maintenance of schedule in the morning. This distribution of trains to insure uninterrupted paving in the morning was most important, and, although, in general, it was accomplished in the ordinary course of operation, at times it entailed long hours on the part of the haulage crews.

"A greasing crew of two men was kept at the plant storage track to inspect and grease all cars. These men also had oil and gas awaiting each locomotive to obviate delay if fuel or oil was needed. A marking system was used to guard against cars' escaping greasing for any length of time, in case trains moved out before greasing was completed. Bearings also were noted upon arrival at the mixer, and any trouble was marked on the side of a batch box in order that the plant crew would catch it and remove the car from the train for further inspection."

The grading outfit, as part of its

regular work, prepared the roadbed for the track on one of the shoulders of the highway. If the roadbed was soft, it was compacted to satisfactory firmness by rolling.

Preliminary Grading—Speed and refinement in the rough grading operations were necessary forerunners to the rapid construction of the slab. Grading was heavy for this part of the country, excavation amounting to 146,000 cu.yd., borrow included. J. C. O'Connor & Sons aided the grading sub-contractor, McElroy Brothers, of Aurora, Ill., in keeping up an outfit which could move earth as rapidly as needed. McElroy Brothers used a Stroud elevating grader with a 42-in. belt, two Monarch 75 tractors, one Caterpillar 60 tractor, and three Caterpillar 30 tractors.

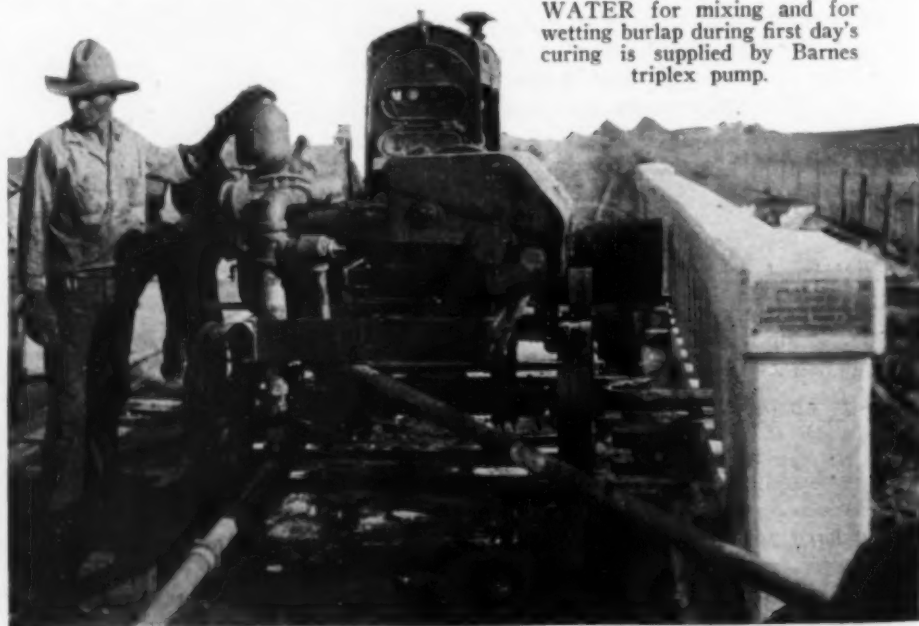
The mixer, starting from Dalton City, ran south 8.2 miles, a short distance beyond the half-way point be-

tween the first and second material-handling set-ups. Bad weather, which had slowed up the grading work, was responsible for the contractor's extending the haul from the first set-up, as Mr. O'Connor explains. "We unbalanced our haul and went a little farther ($\frac{1}{2}$ mile) from our first plant location than we had originally intended because the weather had been so bad that our grading crews could not keep ahead of us. Our plan was to have the grade built from the end of pavement to the location of the second set-up by the time we finished paving from the first set-up. The weather delayed the graders to such an extent that every day was vitally important to them, and we gave them 3 or 4 days additional by extending our paving from the first set-up. The arrangement worked out so precisely that the graders completed the grading only 2 hours before the track-laying gang reached the second set-up. No delay was experienced at this point, because we previously had trucked enough track to the second set-up to lay out our yard arrangement at the plant site."

McElroy Brothers shaped the surface to within $\frac{1}{8}$ in. of true subgrade. In addition to trimming the subgrade of the pavement, they built the shoulders to an extra width and prepared the roadbed for the track. Instead of shaping the grade to the final 40-ft. width, J. C. O'Connor & Sons had the sub-contractor grade to a width of 41 ft. in the cuts and of 42 ft. on the fills. The extra earth was used to form the shoulder against the slab. This method of providing the required earth in advance cut the labor and cost of final shoulder shaping operations.

Preliminary grading was kept as far

WATER for mixing and for wetting burlap during first day's curing is supplied by Barnes triplex pump.





PAVING UNIT, with capacity for high production, is assured of steady supply of materials by thorough organization of transportation system.

as possible in advance of the mixer, usually 6 miles or more ahead of paving operations. Fine grading was done by two Caterpillar 30 tractors, two 6-ft. fresnos, two small Adams graders, a Lakewood subgrader and an Austin 5-ton roller. The job was equipped with 6,000 lin. ft. of Lakewood forms. This quantity allowed forms to be set at all times about 1,500 ft. in advance of the mixer. A Carr form grader prepared the trenches.

Night Shift—An important factor in expediting the work was the employment of a night gang to prepare for the day's run. This gang pulled the forms and moved them ahead, moved the switches, lifted the burlap and distributed it along the forms, and cleaned up in front of the mixer for the morning's paving. The slab was finished with a Lakewood screed and a Lakewood float bridge and belting machine.

An interesting feature of the job was the 4-in. expansion joint which Illinois 1929 specifications required to be placed in the pavement at intervals between 800 and 1,000 ft. One of the illustrations shows the steel bulkhead which J. C. O'Connor & Sons used to form this gap in the slab. The bulkheads were removed on the following morning.

Progress Records—As might be expected on a job of this caliber, the contractor made some noteworthy records. The regular working day was from 6 a.m. to 6:30 p.m. In the 7-day working period from Wednesday, July 17, to Wednesday, July 24, inclusive, the mixer laid 11,053 ft. of pavement, an average of 1,579 ft. a day. The haul, during this period, varied from $3\frac{1}{2}$ to $1\frac{1}{2}$ miles. On July 30, the outfit ran 2,133 ft., establishing what is considered a state record for a 27-E mixer under present specifications.

Shoulder Construction—Mr. O'Connor stresses one operation which is too often neglected in paving work: "There is one point in connection with our job that we pride ourselves upon: the completion of the shoulders. We brought our shoulder outfit upon this job about July 10 and completed our shoulders Sept. 15, just 15 days after the completion of the pavement. As shoulder construction is the bugaboo of many contractors (including our own organization) and as delay in completing shoulders is the cause of carrying over the majority of jobs to the following season, with consequent postponement in payment of final estimates entailing considerable loss of interest, we made a special effort to complete our shoulders this year and succeeded beyond our expectations.

"The outfit was divided into two crews, one for rough finishing and the other for final dressing. A Monarch 75 tractor pulled either a new-type Stroud elevating grader or a 12-ft. Adams blade grader for the roughing crew. This crew also used a 2-ton Caterpillar with fresno scraper and four teams and wagons to end-haul earth where necessary. It placed the earth on the shoulders and rough-

finished the slopes and lines. A finishing crew consisting of about eight men and another 2-ton Caterpillar tractor with 6-ft. Adams blade grader followed the roughing-in gang and did the final dressing of the shoulders.

"We were able to work upon our pavement with the shoulder machinery prior to the expiration of the 21-day curing period, because beam strength tests had been made each day during the paving operation, and the concrete had developed sufficient strength to permit earlier operation of the shoulder outfit.

"The shoulder outfit, prior to coming upon this job, had constructed 12 miles of shoulders carried over from other work of the previous season. Since finishing this 21.3 mile section, it has moved to our job in Indiana, where we expect it to complete a total of 45 miles of shoulder construction for this season."

Management—"The magnitude of the job," says Mr. O'Connor, "suggested the expediency of dividing the major responsibilities. Jack Parker was in charge of grading, being responsible for the operations of the subcontractor, McElroy Brothers. Mr. Parker also was in charge of materials and of bridge and culvert construction. There were nine bridges from 20 to 35 ft. in span. Mr. Dressel (mentioned before as paving superintendent) had charge of material-handling plant, haulage, mixer, and all other operations pertaining to paving.

"This arrangement worked out to the entire satisfaction of all concerned and, through the harmony and interest manifested, the efficiency of the job was greatly enhanced."

Mr. O'Connor himself acted in a general supervisory capacity, keeping in close touch with operations.



GRADE SEPARATION at second plant set-up. Industrial railway passes under Chicago & Eastern Illinois track.

Second of a series of articles on
the \$325,000,000 construction
program for flood control
in the Mississippi Valley

The Defense Against OLD MAN RIVER-II

BY ROBERT K. TOMLIN

Editor of *Construction Methods*

AS OUTLINED by the Mississippi River Commission in its latest published report (June 30, 1929) the main problem of flood control is the protection of a succession of basins below Cairo, Ill., covering an area 600 miles long and 50 miles wide through which must be carried, on its way to the Gulf of Mexico, the runoff from a watershed of 1,240,000 square miles. At bankfull stage the Mississippi River at Cairo carries 1,000,000 cu.ft. per second and at

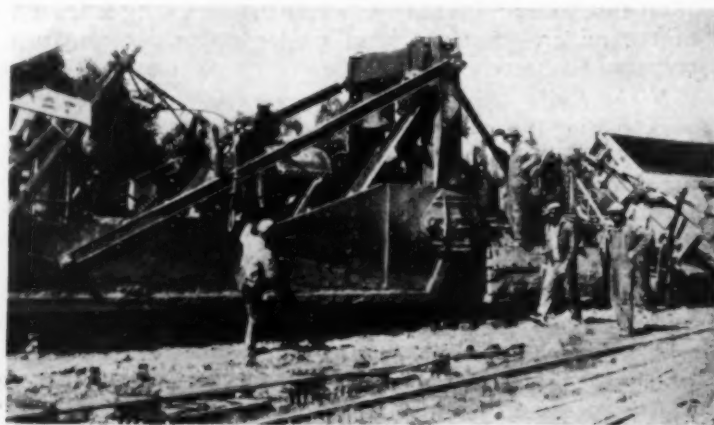
LAST MONTH'S ARTICLE on Mississippi River flood control construction described conditions demanding the use of mechanical equipment for levee building, sketched the organization for the work and summarized contract and specification requirements.

This month, the second article deals with levee construction at Cairo, Ill., in the first field area of the Memphis District.—Editor.

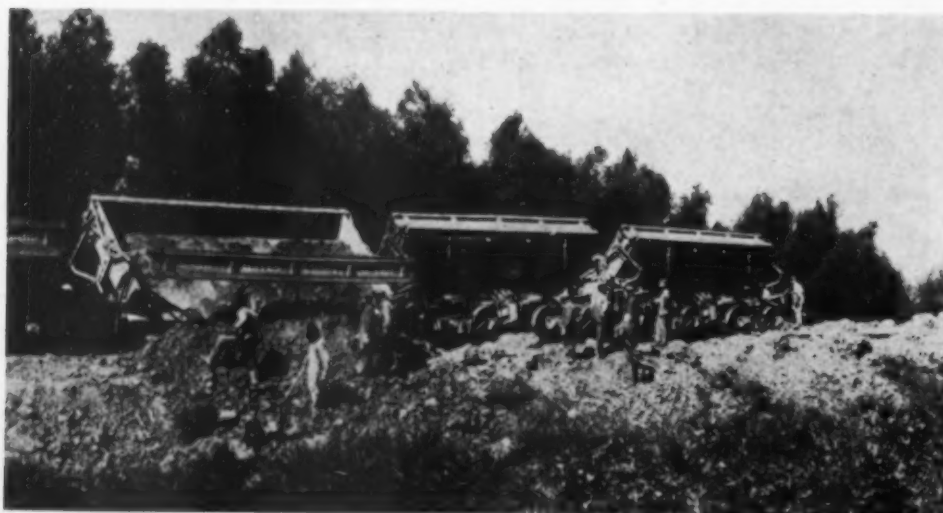
flood flow about 2,000,000 cu.ft. per second. To reclaim and protect the fertile delta basins the flood flow has been constricted in width from 50 miles to a channel sometimes less than 1 mile wide and carried to the Gulf between levees on which construction by the Mississippi River Commission (created in 1879) became active in the early 80's.

Levee building, therefore, is no new problem. Protective embankments of earth have guarded the low-lying lands along the Mississippi for scores of years. On July 1, 1929 there were

LOADING train
(below) of cars at
borrow pit with 2-yd.
steam shovel.



HEAVY BLADES (above) on
Jordan spreader folded in
for return trip of train
to Ward-Hayes bor-
row pit.



DUMPING earth (left) for levee en-
largement from 12-yd. standard-gage
cars at Cairo, Ill.

in place below Rock Island 2,082 miles of levee, containing 540,841,000 cu.yd. of earth fill. The height and bulk of many existing levees, however, proved inadequate to check the more severe floods, so that the ten-year, \$325,000,000 flood control program now under way includes, as its major item, not the building of new levees, but rather the strengthening and enlargement of existing sections. Under present plans it is probable that at least 600,000,000 cu.yd. of earth will be placed in levees during the ten-year construction period. This year's contracts aggregate 68,000,-

9 ft. deep, to be obtained by dredging and training works where necessary between Cairo and New Orleans.

Levee Heights—The extent to which existing levees are being enlarged varies considerably according to local conditions of river and topography. As a rough general average, however, the addition of about 3 ft. in height, with a commensurate increase in the yardage of the section, represents what is being done in many cases. Typical of the newly enlarged levees is one with a net height of about 20 ft. Of the three standard levee sections illus-

©Harris & Ewing



TOPPING OFF and trimming levee slopes with 1½-yd. crawler-mounted gasoline draglines. LIEUT.-COL. F. B. WILBY (above), engineer officer in charge of Memphis district.

000 cu.yd. at a cost of \$15,840,000, while construction by day labor totals 7,500,000 cu.yd. at a cost of \$1,640,000.

Features of Plan—Essential features of the ten-year plan, as specified in the Flood Control Act of 1928, are:

- (1) Floodways from Cairo to New Madrid; from the Arkansas River through the Tensas basin to the Red River; and from the Red River through the Atchafalaya basin to the Gulf of Mexico. These will relieve the main channel of the water it cannot carry and lower the floods to stages at which the levees can carry them.
- (2) A controlled spillway (Bonnet Carré) to hold the levels down to safe stages at or near New Orleans.
- (3) Local setting back of the levees in the main river at bottle-necks to increase its carrying capacity and reduce its flood heights.
- (4) Greater protection against crevasses

by strengthening the levees; by reducing flood heights through the increased width of channel afforded by floodways, spillways and setbacks; and by moderately raising the levees where needed to meet predicted flood stages.

(5) Progressive revetment of caving banks to protect the foundation of the levees and to stabilize the river both for flood control and navigation.

(6) Improved navigation channels for river traffic, not less than 300 ft. wide and

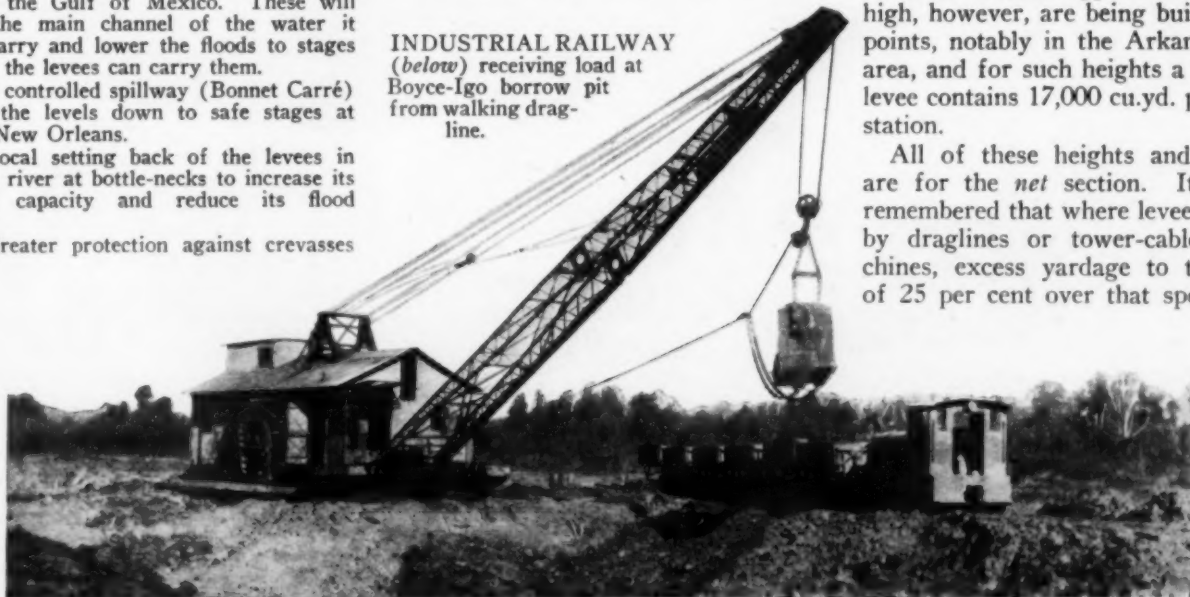
trated in last month's issue (p. 38), Section B (with a top width of 10 ft., riverside slope of 3½ to 1 and landside slope of 6 to 1) is the one most often specified. This section is for material consisting of less than 75 per cent sand, buckshot, or clay and contains between 8,000 and 9,000 cu.yd. per "station" (100 ft.).

Levee sections approximately 30 ft. high, however, are being built at some points, notably in the Arkansas River area, and for such heights a Section B levee contains 17,000 cu.yd. per 100-ft. station.

All of these heights and yardages are for the *net* section. It must be remembered that where levees are built by draglines or tower-cableway machines, excess yardage to the extent of 25 per cent over that specified for

INDUSTRIAL RAILWAY

(below) receiving load at Boyce-Igo borrow pit from walking dragline.



the net section must actually be placed to allow for shrinkage and settlement. On this basis it is seen that the contractor must build to a height of 37½ ft. for a levee of 30-ft. net height.

* * *

With these general conditions in mind, let us don khaki shirt, whipcord breeches and a pair of high leather boots—for the mud is deep and sticky—and get out on the job with T. T. Knappen, area engineer, and G. L. Perry, associate engineer, in charge of construction between Cape Girardeau, Mo. and Dyersburg, Tenn., in the first field area of the Memphis district, under the direction of Lieut.-Col. Francis B. Wilby, district engineer.

To Protect Cairo—For the protection of Cairo, Ill., located in the fork formed by the junction of the Ohio with the Mississippi River, special conditions involving a combined railway embankment and levee on the west side, and a built-up industrial area along the Ohio River at Mound City,

T. T. KNAPPEN, engineer in charge, first field area, Memphis district.



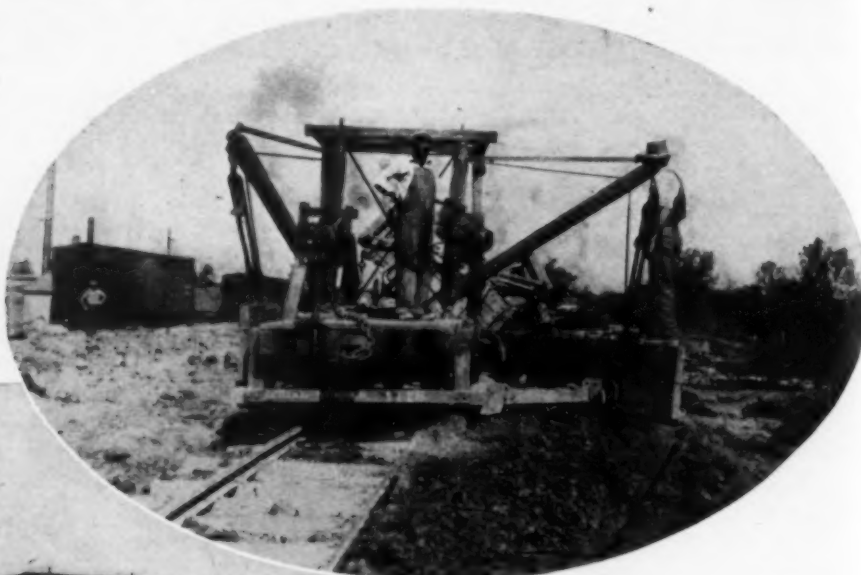
SHIFTING TRACK with ratchet jack at Mound City.

to the north, have resulted in levee construction methods and equipment which are not typical of the work further down the river. At Cairo are being used both standard-gage and industrial railway outfits, a type of equipment comparatively rare on the river work and observed at only a couple of other locations, to be described in a later article.

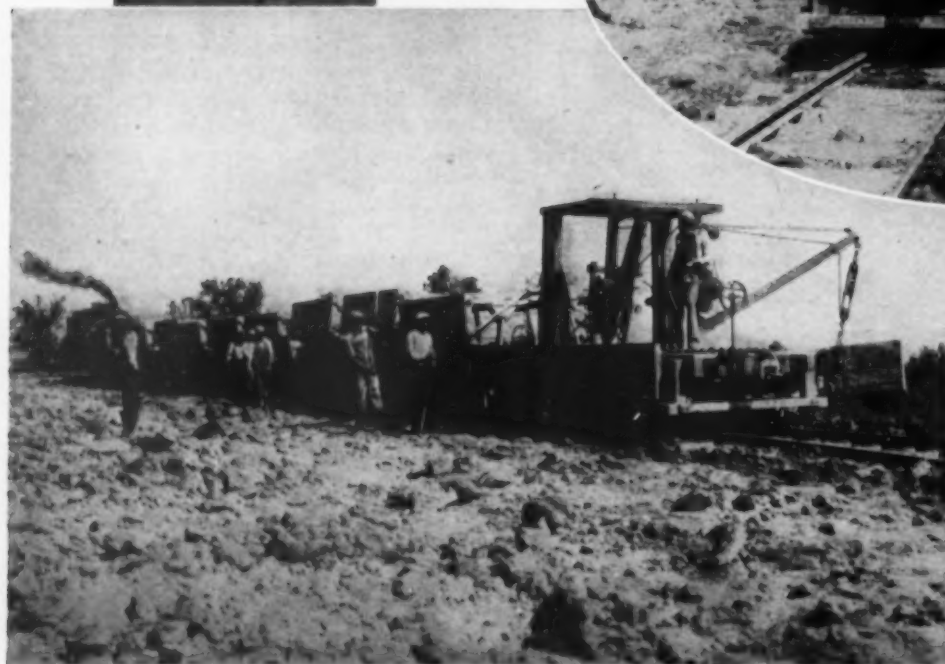
On the west side levee enlargement at Cairo, the work is divided among the following four contractors: J. L.

Ward Co., (876,000 cu.yd. at 47.9c.—awarded in 1928); Ward-Hayes Construction Co., (120,000 cu.yd. at 70c.); J. H. Boyce & Sons and R. L. Igo, (152,000 cu.yd. at 56c.); and J. J. McCaughey Co., (145,000 cu.yd. at 27.9c.). The job at Mound City along the Ohio River north of Cairo, involving 260,000 cu.yd. at 48c., is being handled by the Ward-Hayes Construction Co.

The west side levee construction at Cairo is essentially enlargement work without the convenience of borrow pits near the toe of the fill. The location is along a combined levee and embankment that carries the tracks of the Mobile & Ohio Railroad, with another line, the Missouri Pacific, paralleling the work on the Mississippi River side and precluding the use of borrow within easy reach of the embankment. It became necessary, therefore, to go to the northerly end of the levee to obtain most of the material for the new fill for the Ward and the Ward-Hayes contracts and to haul it to place over the standard-gage M. & O. tracks. At the borrow pit serving both sections of the work loading is done by crawler-mounted steam shovel delivering to 12-yd. standard-gage Western dump-cars operated



FILL (left) for Mound City job hauled in by industrial railway, with blade spreader (above).



in 14-car trains by three 21-ton steam locomotives. After dumping, the earth is distributed by a heavy-bladed Jordan spreader and the embankment is topped off and brought to line and grade by 1½-yd. Link-Belt and Osgood draglines on crawlers.

One of the difficulties encountered on this section was the necessity of sandwiching the earth-carrying construction trains in between those for regular passenger and freight service

on the main line of the M. & O. To comply with legal requirements the contractor had to man every work train with a complete railroad operating crew. The unit price on the Ward-Hayes job, 70c. per cubic yard, reflects the unusual levee-building conditions of distant borrow pit, involving a haul of 4 to 5 miles and standard-gage railroad transportation on a schedule carrying main-line freight and passenger service.

On the Boyce-Igo contract, to the south, a borrow pit nearer the levee is available and from it the contractors operate an industrial railway. Loading is done by a 3½-yd. Monighan dragline delivering to trains of 5-yd. Western side-dump units hauled by 12-ton Vulcan locomotives. A second dragline at the levee rehandles the fill delivered by the industrial railway.

At the southerly end of the work the McCaughey organization is working with 1½-yd. Northwest dragline, Caterpillar tractors, 7-yd. Western crawler wagons a couple of Linn tractors and motor trucks. Under sub-contract T. W. Crowe operates a 3½-yd. Bucyrus dragline delivering material directly to the levee.

The other Ward-Hayes job, on the



WILLIAM ROTH, contractor of Hickman, Ky., is making excellent progress on Sikeston Ridge extension.

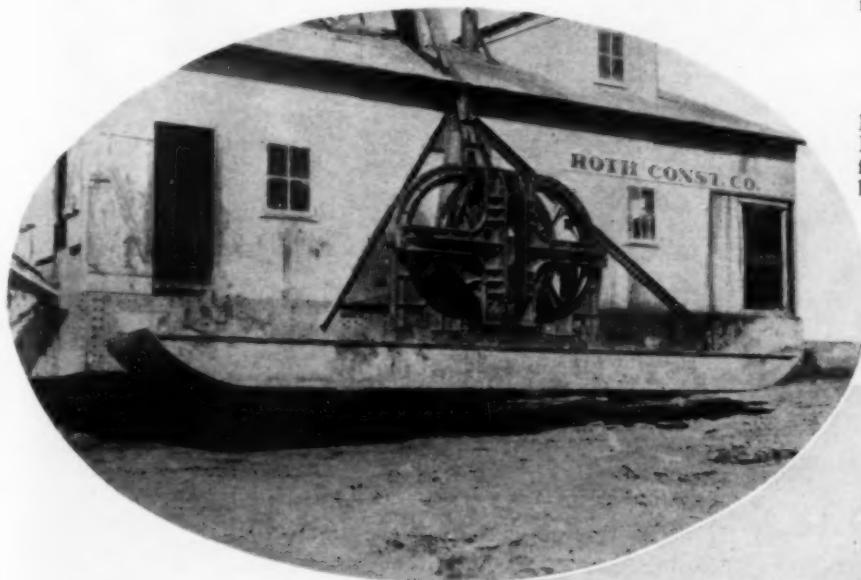
Section B levee, bid in at a price of 20c. per yard. The material is a sandy loam and clay mixture, with borrow pits advantageously located along the levee so that a 180-hp. Diesel-powered Monighan dragline, with 110-ft. boom and 4-yd. bucket, can excavate and place the earth in the levee section with a single cast. Working night and day under the supervision of William Roth the crew of 18 to 20 men on this job have been able to deliver a uniformly high output (between 90,000 and 100,000 cu.yd.) month after month. Skillful dragline operation characterizes this contract. There is a minimum of wasteful motion in handling the bucket and the spotting and dumping are done so expertly that very little trimming is needed to bring the slopes of the fill to the specified lines and grades.

* * *

[[NEXT MONTH: Levee construction details along the Reelfoot front south of Hickman, Kentucky.]]



G. L. PERRY, associate engineer, first field area Memphis district.



DIRECT PLACEMENT (below) of fill from borrow pit to levee section is accomplished by this walking dragline on Roth contract. DETAILS (left) of walking mechanism for dragline.

Ohio River front at Mound City, is a haul-in operation with industrial railway. The equipment includes Marion and Osgood steam shovels at the borrow pit, Vulcan steam locomotives, 5-yd. Western side-dump cars and Western blade spreader.

Sikeston Ridge Extension—More typical of levee construction under normal Mississippi River conditions, however, is the Sikeston ridge extension south of New Madrid, Mo., which is being built by the Roth Construction Co., of Hickman, Ky. This is a contract aggregating 930,000 yd. of



LATIN-AMERICA'S MILEAGE OF

Photographs from
MAJOR F. A. REIMER, President,
American Road Builders' Association

Keeps Pace With

Photographs of South American Roads on this and the opposite page were taken by Major Reimer, on his trip through South America at the time of the Second Pan-American Highway Congress, held in Rio de Janeiro last August.



MONUMENT to mark completion of highway from Rio de Janeiro to Sao Paulo, Brazil, is dedicated as part of program of Second Pan-American Highway Congress. THIRTY-SEVEN S-TURNS (right) take Chilean highway between Santiago and Valparaiso down west side of coastal range.



ROUGH COUNTRY FOR ROAD BUILDING. Members of United States party look over topography at present end of first highway from La Paz, Bolivia, to east. Altitude at this point, 25 miles from La Paz, is 15,300 ft. Road will open petroleum, rubber and grazing lands.



TWO STRIPS OF CONCRETE (above), 20 in. wide, have been laid along a 20-mile stretch of road from Calama, Chile, to Anaconda copper mines at Chuquicamata (El. 9,500). Up traffic has right-of-way. Turn-outs are provided for passing at intervals. SMALL RANSOME MIXER (right) lays section of 20-ft. concrete pavement in two 10-ft. strips on road between Rio de Janeiro and Petropolis, Brazil.

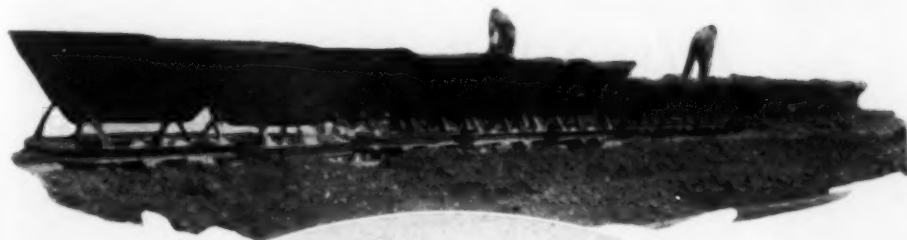


BITUMINOUS STRIP, 6½ ft. wide, separates two concrete strips on Rio de Janeiro-Petropolis road (below).



NEW AND IMPROVED ROADS

Industrial Progress



ROLL-OVER, V-TYPE CARS (above, left) on concrete paving job near Santiago, Chile, dump into skip of Ransome 27-E mixer (in oval). Awnings in left background travel on forms, protecting concrete until it takes initial set. Tall man without overcoat, at right in oval, is FRANCISCO G. LEIGHTON DONOSO, Chilean government engineer. DR. TIMOTHEO O. PENTEADO (at left in front row above) is chief engineer in charge of all federal highway work in Brazil. Others in photograph also are South American highway officials.

Two of Mexico's Latest Highway Projects



WALL AND GUARD RAIL at hillside curve on highway between Mexico City and Acapulco. REMOVING LOOSE ROCK (*extreme right*) from sheer walls of deep cut on same highway. (In circle) GRADING WORK south of Monterey on road from Mexico City to Laredo, Tex.



Photographs from OCTAVIO DUBOIS, President National Highway Commission, Mexico, D. F.



OLD CONCRETE BASE, 10 to 12 in. thick, is broken out and removed by power shovel dipper loading into motor trucks.

HIGH-EARLY-STRENGTH cement demonstrated its effectiveness as an aid to traffic during the repaving of Baronne St., one of the most heavily traveled thoroughfares in the business section of New Orleans, La. The street, 40 ft. wide between curbs and carrying two lines of street railway track, had been paved some 25 years ago with sheet asphalt on a 10- to 12-in. concrete base. The present repaving involves breaking out and removing the old base, laying a new concrete base 8 in. thick and surfacing with a 2-in. bituminous top.

The essence of the job was to get the repaved street back into service just as quickly as possible and thereby reduce to a minimum the period dur-

CAST CYLINDERS (right) of concrete form wheels for Fordson subgrade roller.



11 Days Saved in Restoring Traffic to Busy Street After Repaving

THE ANSWER:
High-Early-Strength Concrete



CONCRETE FOR NEW BASE, made of high-early-strength cement, is delivered to job by truck from central mixing plant.



ing which traffic would be forced to travel on a half-width street or detour to other congested downtown thoroughfares. The controlling time-element in the construction was the period necessary for the new concrete base to set. It was decided, therefore, to shorten this time by employing Incor high-early-strength cement for the new concrete base instead of ordinary portland cement. The result fulfilled expectations. It was found that traffic could safely be restored to the new base from 48 to 72 hours after the concrete had been poured, a saving estimated at about 11 days, on the average, as compared with the time it would have been necessary to allow for the setting and curing of a slab in which ordinary portland cement was used.

The repaving is being done under contract in half widths by Craven &

PNEUMATIC HAND HAMMERS (left) served by portable gasoline air compressor, help steam shovel break out old concrete base.



BOTTOM COURSE of new pavement is dumped in strip between car tracks.

Lang, contractors of New Orleans, with the New Orleans Public Service responsible for the section between its street railway track and 18 in. beyond the outer rails. The old sheet asphalt pavement and concrete base first were broken out with a Thew gasoline

encumbrance. Concrete, therefore, was produced at a nearby central plant equipped with a 27-E Koehring mixer, and delivered to the job by a fleet of International end-dump motor trucks. The average haul of about 12 city blocks required 12 to 15 min. The mixture used was 1:2½:5, showing a 2½-in. slump. The coarse aggregate was gravel. A complicating construction factor was the necessity for handling cross traffic by leaving street intersections open as long as possible or bridging them.

The new paved surface consists of

Rows of granite liners are interposed between the asphalt pavement and the rails of the street car tracks.

Special details of the design are an 18-in. gutter bottom monolithic with the concrete base and the support of the curbing on piers employing a form of cantilever construction for a section 1 ft. wide at curb joints. A decidedly novel touch will be given to the new sidewalks along Baronne St. by coloring them green by the use of Chromium oxide.

Under the general direction of John Klorer, Commissioner of Public Prop-



SMOOTHING AND TAMPING bituminous surfacing is done with heated hand tools.



FIRST ROLLING (above) is with light hand roller to smooth but not compact surface material.

SECOND ROLLING (right) with 10-ton unit compacts material and binds and blends the top and bottom courses.

shovel on crawlers, aided by hand hammers receiving air from a Chicago Pneumatic portable gasoline compressor. The debris from the old base, instead of being wasted, is usefully employed either as ballast for sinking willow mat revetment along the waterfront or, after crushing, for surfacing unimproved streets.

In the wake of the pavement-breaking crew the subgrade is smoothed and compacted by a light roller consisting of a Fordson tractor with wide wheels made of concrete cylinders, as illustrated in one of the photographs.

In the cramped quarters available for carrying on the work in half widths a mixer would have been an

a Warrenite-Bitulithic top, comprising a coarse aggregate bottom course 1½ in. thick covered, after smoothing with a light hand roller, with a ¼-in. wearing surface. Compaction is obtained with a 10-ton Huber gasoline-powered three-wheel roller and finishing is done with a 5-ton steam roller. The methods are those customarily followed to procure a bonding and blending of the two courses of asphaltic material employed for this type of pavement.



erty, Bryson Vallas, city engineer of New Orleans, is in charge of the repaving program. P. H. Quinlan is principal assistant engineer on construction and D. L. Scharff is assistant engineer.



Typical GRADE SEPARATION STRUCTURES in North Carolina

VARIETY in structural design to meet economic and site conditions is one of the outstanding features of North Carolina's grade crossing elimination program which is being carried on under the direction of John D. Waldrop, chief engineer of the North Carolina State Highway Commission, with W. L. Craven, bridge engineer, in immediate charge of the work.



REINFORCED - CONCRETE DECK - GIRDER SPANS (at top) carry heavily traveled highway over double-track main line. E. H. Wood & Co., contractor. COMBINATION CREEK AND RAILROAD CROSSING (lower photograph). Railroad is between first steel bent and steel towers with space for two tracks. Deck steel truss, 64-ft. span on concrete piers, carries roadway over creek. All stringers are of steel with reinforced-concrete roadway decking. Roanoke Iron & Bridge Co., contractor.



DECK PLATE GIRDERS of 120-ft. span (above) on structural steel bents, all on a 45-deg. skew. Built by Norfolk & Southern Railway. LOW 85-FT. STEEL TRUSS SPAN (right) providing space for three railroad tracks. Approaches and entire roadway of creosoted timber. Atlantic Bridge Co., contractor.



Present and Accounted For —

A Page of Personalities



For Treasurer, JAMES H. MACDONALD,
Consulting road and paving Expert,
New Haven, Conn.



For President, W. A. VAN DUZER, Asst.
chief engineer, Pennsylvania Dept. of
Highways, Harrisburg, Pa.



For Vice-President, HENRY G. SHIRLEY,
State highway commissioner,
Richmond, Va.

OFFICIAL NOMINEES

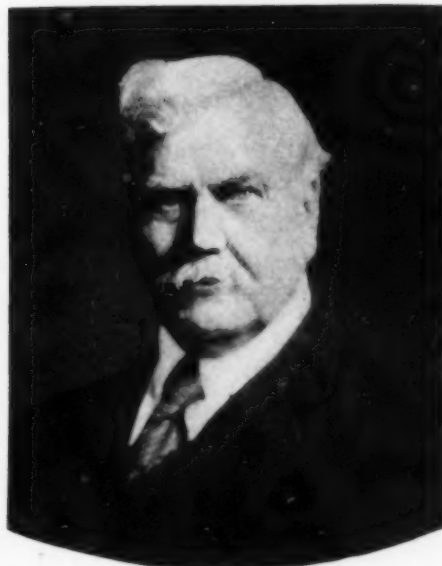
for Year 1930-31

AMERICAN ROAD BUILDERS' ASSOCIATION



For Vice-President, S. F. BEATTY,
President, Austin-Western Road
Machinery Co., Chicago

For Vice-President, SAMUEL HILL, Honorary
life president, Washington State
Good Roads Assoc., Seattle



For Vice-President, J. R. DRANEY, Natural
Rock Asphalt Corporation,
Louisville, Ky.

MATERIAL - HANDLING PLANT. Crane unloads cars and feeds bins which discharge through hopper into trucks.



MACHINES SPEED

Paving Mixer and Power Winch Expedite Traffic- Bound Treatment

IN SPREADING slag to be bound by traffic on the surface of secondary roads, contractors on two sections in Delaware recently utilized entirely different, but very effective, mechanical means of increasing the quantity of surfacing material distributed per day. The two contracts were part of the State Highway Department's program of low cost road improvement, which aims to make a number of secondary highways capable of carrying traffic at high speed.

Previously, on many of these roads, an average speed of 15 miles an hour could be maintained in summer; but, in winter, most of them were impassable. Now, vehicles can be driven

over them at the maximum speed allowed by law.

The method of improving the road consists of spreading a thin layer of small-size broken slag or stone and maintaining the surface in a smooth

By WILLIAM A. MCWILLIAMS

*Maintenance Engineer,
State Highway Department,
Dover, Del.*

PLATFORM (right), attached in front of spreader, elevates trucks to dump loads of slag into hopper of spreader. POWER WINCH (below), mounted on truck, pulls platform and spreader. Spreading operation is continuous except for short delays while charging spreader and moving truck which carries winch.



SPREADING OF SLAG

condition by blading and dragging at frequent intervals. Due attention is given to line and grade on the earth road to be treated. For big jobs of grade preparation, the usual equipment of tractors and graders, small power shovels, trucks and wheel scrapers is needed in various parts of the work.

After the subgrade has been prepared, the surface material is spread at

this way the slag surfacing becomes thoroughly compacted under traffic.

The two methods of placing the slag on the subgrade are shown in the accompanying pictures. On one job from Dover to Hazletville, under contract to George & Lynch, of Dover, Del., an old concrete mixer that had been discarded was reconditioned and used to place the slag in the spreader, as well as to pull the spreader along the grade. With this method the contractor was able to lay 7 miles of traffic-bound road in 11 working days, averaging over 3,360 lin.ft., 16 ft. wide, 4 in. deep. The biggest day's run was 4,300 lin.ft., requiring the

placing of more than 800 tons of material in 10 hours.

Another method, used by Field, Barker & Underwood, of Philadelphia, Pa., employed a wooden platform built in front of and attached to the Burch spreader. Light 1½-ton trucks backed on to the platform and dumped into the spreader. The platform and spreader were pulled along the subgrade by means of a cable attached to a small gasoline-operated winch, mounted on a 5-ton truck. With this method, the contractor was able to lay from 2,500 to 3,000 lin.ft. a day. This rate of progress requires the placing of about 500 tons in a 10-hour working day.

The work on these sections was performed under the supervision of the State Highway Department at Dover, Del., W. W. Mack, chief engineer.



TRUCKS DUMP into skip of old paving mixer, reconditioned to feed spreader and to pull it.

the rate of 1,000 tons to the mile. Best results have been obtained with material passing a 1-in. screen and retained on the No. 10 sieve. The slag or stone is placed, in the first operation, 4 in. thick and 16 ft. wide. It then is bladed to the sides of the road in windrows, leaving a layer 1 in. in thickness on the subgrade. Traffic is turned on the road, and, as weak places develop, additional slag is dragged in from the windrows along the sides. In



AFTER SPREADING slag to depth of 4 in., one-man grader blades top 3 in. into windrows along side of road. This material later is used to build up surface as traffic compacts slag.

PRACTICALLY CONTINUOUS OPERATION is obtained by using paving mixer (below) to feed and pull spreader. Only interruptions are brief stops while trucks dump loads into skip of mixer.



St. Louis Municipal Airport

TESTS VARIOUS RUNWAY

SURFACES

A VARIETY of runway surfaces have been constructed by St. Louis city engineers to determine by actual test the most economical types for use at the municipal airport. Load conditions for airports in all parts of the country are practically equal, but the supporting power of subgrades varies greatly. At the St. Louis airport, the installation of a well-planned drainage system, insuring to the silt-loam soil a high bearing value, justified the construction of rather light surfaces. The experimental runway surfaces include mixed-in-place bituminous earth construction; hot-mixed pavement consisting of black base and sheet asphalt top; asphalt macadam; bituminous pavement using asphalt-bound earth to the greatest possible degree; asphalt macadam in which asphalt-bound earth is used as filler; and reinforced-concrete slab. In addition to these runway surfaces, the airport has been provided with a concrete apron and an adjoining strip of oiled earth.

Development Policy—The engineers' policy in undertaking construction was conservative and wise. Urged on by an insistent popular demand for large-scale construction and faced by a decided lack of established technique, or even of a consensus of engineering



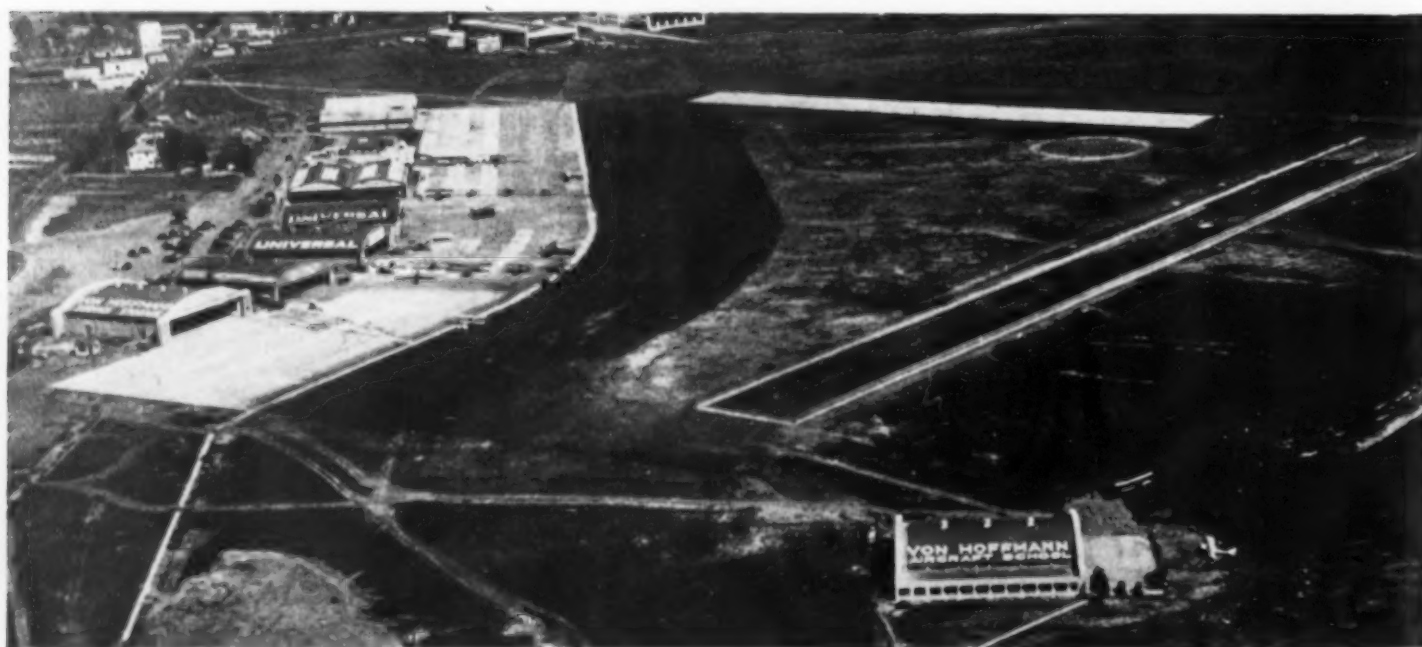
STORM DRAIN CONSTRUCTION. Main drains can take off a one-year-frequency rain very nearly as fast as it falls. Small drains discharge into main drain at manhole.

opinion on the basic factors affecting airport design, those in charge of construction made the very practical

decision to provide adequately for expected development, but to defer expenditures as far as practicable until observation of the first structures tried shall have disclosed the most satisfactory types.

The first and most urgently needed improvement at the airport was the construction of the service apron in front of the hangars and passenger terminals. A concrete apron 200 ft. wide and 1,500 ft. long, extending the full length of the buildings, was built by the Kesi-Lonergan Co. The apron was laid in ten 20-ft. strips of 8-6-8-in. pavement, divided into 10-ft. lanes by the standard center joint construction.

Drainage—When the engineers came to the problem of designing field drainage, they were handicapped in several respects by lack of information on this important phase of airport development. The main drains, as finally laid out, were located as far as possible along the edges of the runways to serve as border intakes for the heavy runoff of the surfaced areas. All drain trenches are refilled completely to the surface with coarse stone. This filling provides satisfactory inlet



ST. LOUIS MUNICIPAL AIRPORT. Note concrete apron in front of hangars, first experimental runway extending diagonally to right margin, and sheet asphalt pavement (white in appearance) under construction in background. Dark strip in front of apron is oiled surface. Rock-filled storm drains along apron and around experimental runway can be seen. Third runway has been constructed, since this photograph was made, just beyond and parallel with Von Hoffman Aircraft School in foreground.



BLACK BASE MIXTURE for hot-mix pavement is dumped on metal platform attached to truck.

capacity for surface water, and it is expected also to separate the blocks of soil and to prevent seepage of ground water. An adequate system of 6-in. tile drains, connecting with the main drains, was installed in lower portions of the field. Drainage work was divided into two contracts, performed by R. J. Blackburn and the Myers Construction Co.

Character of Soil—Drainage was the greatest need of the soil, a heavy silt-loam 12 to 18 in. deep, well supplied with organic matter. When dry, this soil is mellow and easy to work. Numerous laboratory tests were made to determine the most satisfactory designs of mixed-in-place pavements.

First Experimental Runway—Bangert Brothers, of Ferguson, Mo., built the original experimental runway of mixed-in-place bituminous surface. The runway was divided into sections for

the purpose of testing various materials and combinations of materials. Equal parts of earth and metal were mixed on all portions. With disk harrow, blade grader, Baker-Maney scrapers, and Caterpillar 60 tractor, the contractor removed 1 to 1½ in. of earth and organic matter from the surface. The disk harrow then cut the earth to 2-in. depth, and a clod breaker pulverized the material. The pulverized earth was primed with .5 gal. of road oil per square yard, thoroughly mixed by disk harrow and blade grader, and the base was sealed with .3 gal. of road oil to the square yard.

Three Asphalt Treatments—Three

ROAD MAINTAINER makes first round after oil application to mix 1-in. layer of asphalt-macadam pavement in which asphalt-bound earth is used as filler.

sections of the runway were given different asphalt treatments. On one section, three applications of cut-back asphalt (.5 gal. each) were made directly to the pulverized earth and were worked in by disk harrow and blade grader. The cut-back had a tendency to ball and become gummy in spots. It was very hard to work to a uniform mix. Road oil was applied to this mixture before stone and the asphalt-bound earth were mixed to form the final pavement.

On a second section, an asphaltic mixture composed of two parts cut-back (70 per cent asphalt) and one part 60 per cent asphaltic road oil was applied in the amount of .5 gal. per square yard, with satisfactory results. This combination was used for the runway generally, with variation in the proportions to suit changing conditions.

The third section was treated with a cut-back made up of 70 per cent asphalt and a solvent which penetrated the earth readily and mixed easily, neither drying nor curing too quickly. A mealy, plastic pavement was obtained. The results were so satisfactory that this specification was made an alternate on two sections of another runway constructed later.

Construction Procedure—The procedure followed on the greater portion of the first runway was to prime the earth and to spread and work in the stone and the asphaltic mixture of two



parts cut-back and one part road oil in three operations. The contractor spread 1 in. of stone, applied the asphaltic mixture at the rate of about .3 gal. per trip until 1 to 1.5 gal. had been distributed, and mixed in this layer with the blade grader or the maintainer before making the second or third addition of stone and asphalt. The runway, as finished, contained a little

plow, one double disk harrow, one blade machine of at least 12-ft. blade, one road maintainer, one self-propelled 8-ton tandem roller, and an asphalt distributor. Bangert Brothers and Shekdon Hayes were the contractors on the two sections.

The first of the two sections is an asphalt-bound earth mixture, without any addition of stone, 3 in. in thick-

voids are filled with earth. On this section, the subgrade was primed, the stone was placed in 1-in. layers treated with .75 gal. per square yard of cut-back and road oil, oiled earth was bladed over each stone layer to fill the voids, and the layer then was worked with blade grader and maintainer until mixed. The rolled surface was sealed with cut-back asphalt and stone chips.



TANDEM ROLLER compacts 1-in. sheet asphalt top on 3-in. asphaltic concrete base course. LONG HANDLED STRAIGHT-EDGES (left) are used to level top course prior to rolling.

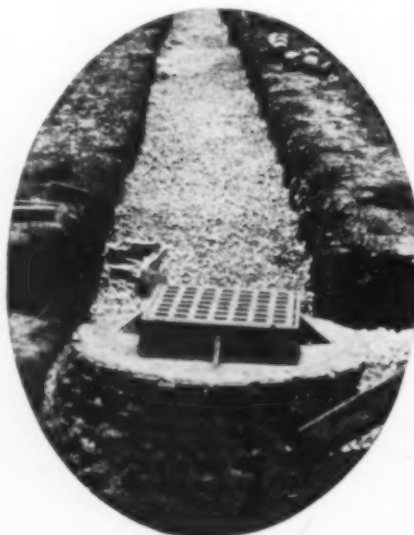
more than 3 gal. of bitumen to the square yard and cost about 90c. per square yard, the cost being higher than normal because of the experimental character of the work. The final operation consisted of rolling the pavement with a 10-ton, three-wheel roller.

Tar Section—One section of runway was made with tar by building up layer upon layer of stone, tar, and earth, unmixed, but compacted by rolling. The base was sealed with Tarvia A and covered with stone which was rolled into the earth. Stone then was added in $\frac{1}{2}$ -in. layers, each layer being treated with Tarvia B Special, and covered with enough earth to fill the voids before being rolled. After the last application of tar, the maintainer thoroughly mixed the top layer before final rolling.

To seal the runway, about .15 gal. of asphaltic mixture per square yard first was applied to the entire surface. A mixture of stone and cut-back asphalt then was used to fill the depressions in the surface. Finally, about 15 lb. of coarse chats to the square yard was spread, and the final seal of a light cut-back was applied at the rate of .15 gal. per square yard.

Other Asphalt Sections—Utilizing the experience gained on the first experimental runway, variations of the designs were tried in constructing two contract sections of 5,000 sq.yd. each on another runway. The work on each of these sections required two tractors (at least one of 10-ton size), one gang

ness, covered with a 1-in. stone asphalt top mixed in place. Priming the pulverized earth on this section required .5 gal. of road oil per square yard, and sealing the base required .33 gal. The 3-in. layer of asphalt-bound earth involved the incorporation of 2.5 gal. of the mixture of cut-back and road oil,



REFILLED WITH ROCK, trenches of main drains have large intake capacity. They also separate soil into blocks, preventing lateral movement of ground water.

placed in four applications carefully worked. Approximately .6 gal. per square yard of cut-back asphalt was used in the stone surface, including the amount for the seal coat.

The second section consists of a 4-in. crushed stone pavement in which the stone is coated with asphalt and the

This runway also includes a section of 6-in. concrete slab reinforced with wire mesh. Six bags of cement to the cubic yard were used in the mix. The Skrainka Construction Co., St. Louis, built the slab.

Hot-Mix Pavement—A third runway of the highest type of light bituminous construction possible was built by the Central Paving & Construction Company, St. Louis, Mo. This surface consists of Texaco 3-in. black base, and 1-in. sheet asphalt top, laid according to standard paving methods for hot-mix construction. Two metal dump boards were used in unloading the trucks, a board being attached to a truck before dumping.

The full list of paved runways includes: first, the original experimental runway costing 90c. per square yard, but probably to be duplicated, if desired, for 75c.; second, the hot-mixed pavement, 4 in. thick, costing \$1.40, probably not to be duplicated generally for less than \$1.60; third, the 4-in. bituminous pavement using asphalt-bound earth to greatest possible degree, costing 90c.; fourth, the 4-in. asphalt macadam pavement in which asphalt-bound earth is used as filler, costing 99c.; fifth, the 6-in. reinforced-concrete slab, costing \$2.

W. W. Horner, chief engineer, Division of Sewers and Paving, is in charge of drainage and surface works at the airport. Mark Thompson, asphalt engineer for the division, carried on the laboratory tests and directed the experimental construction.

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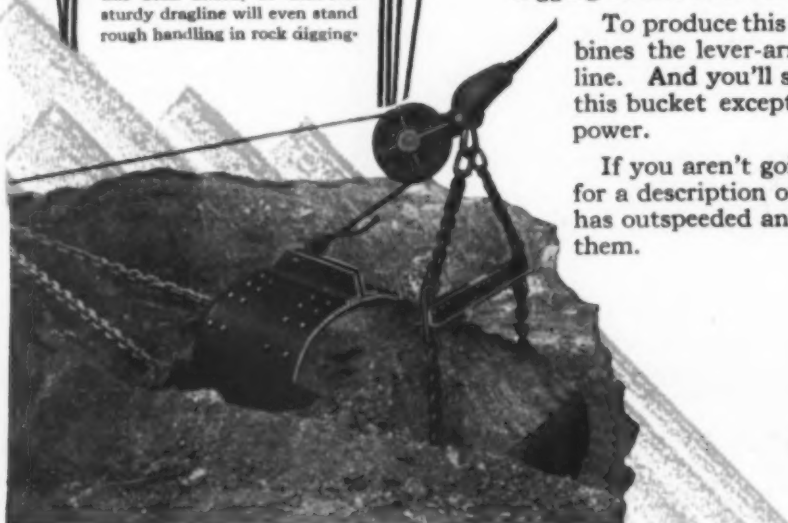
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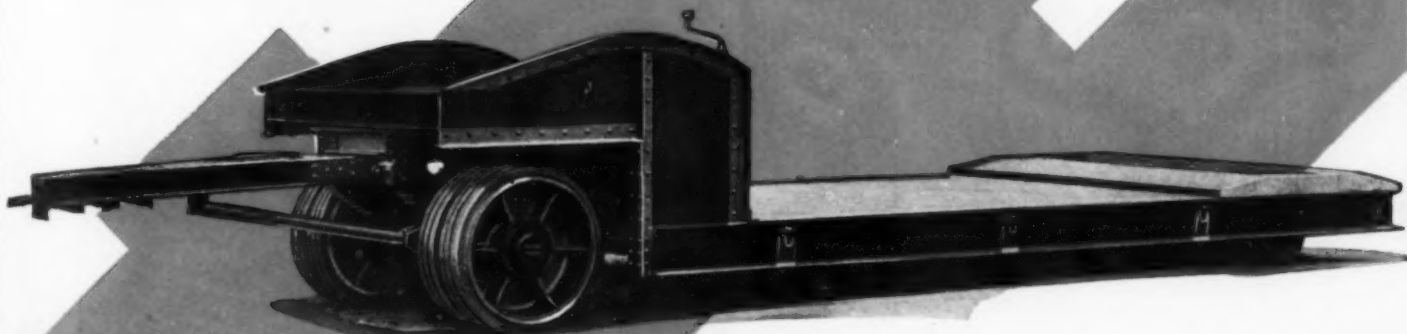
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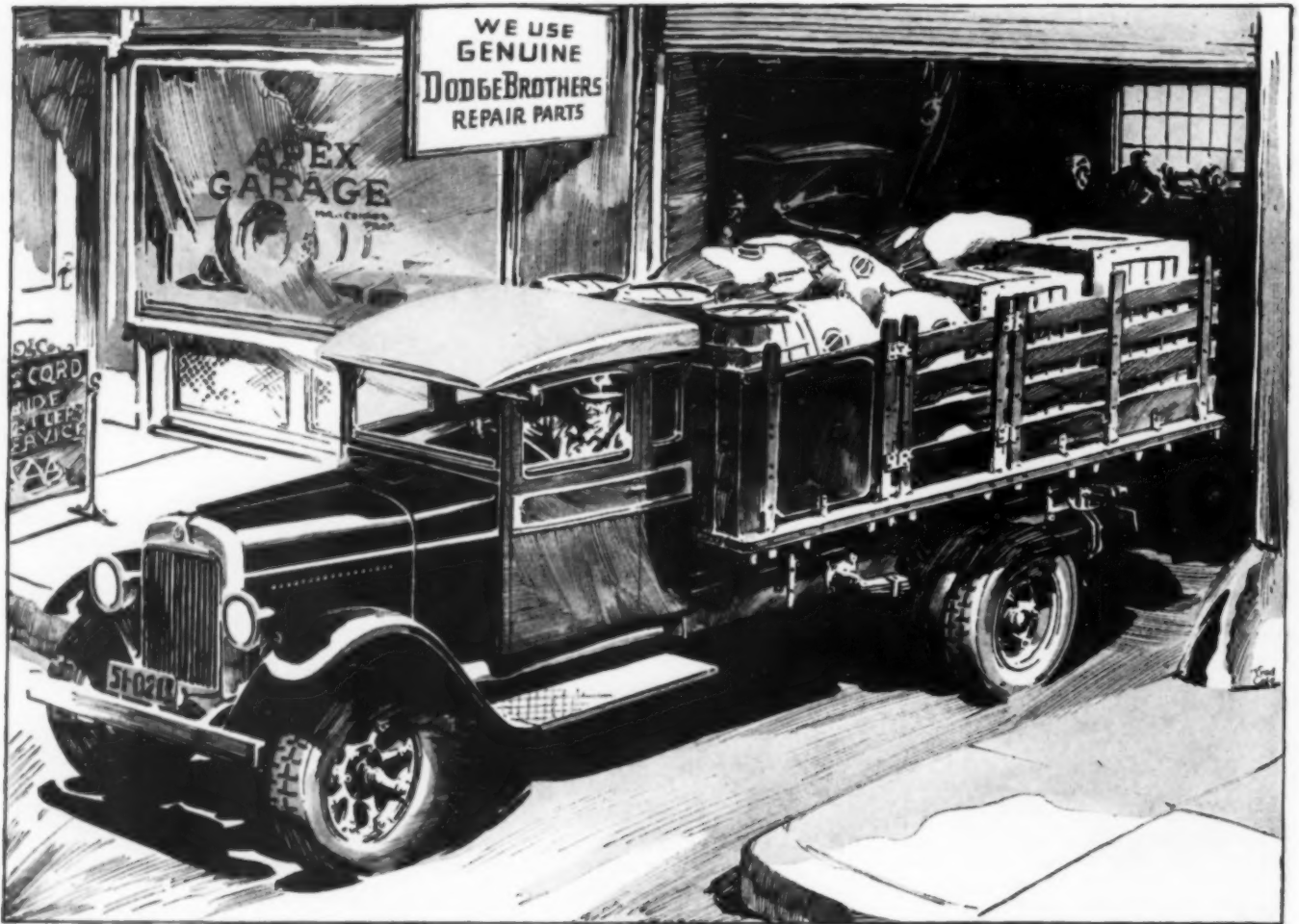
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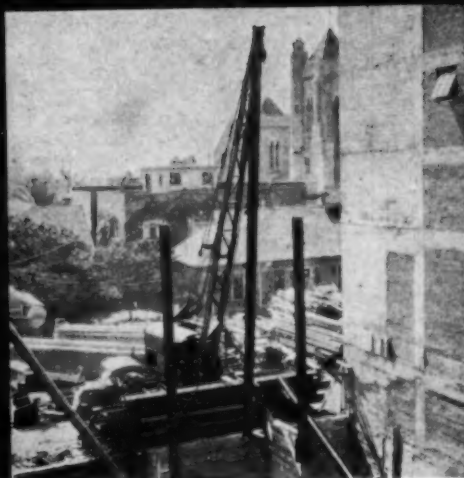
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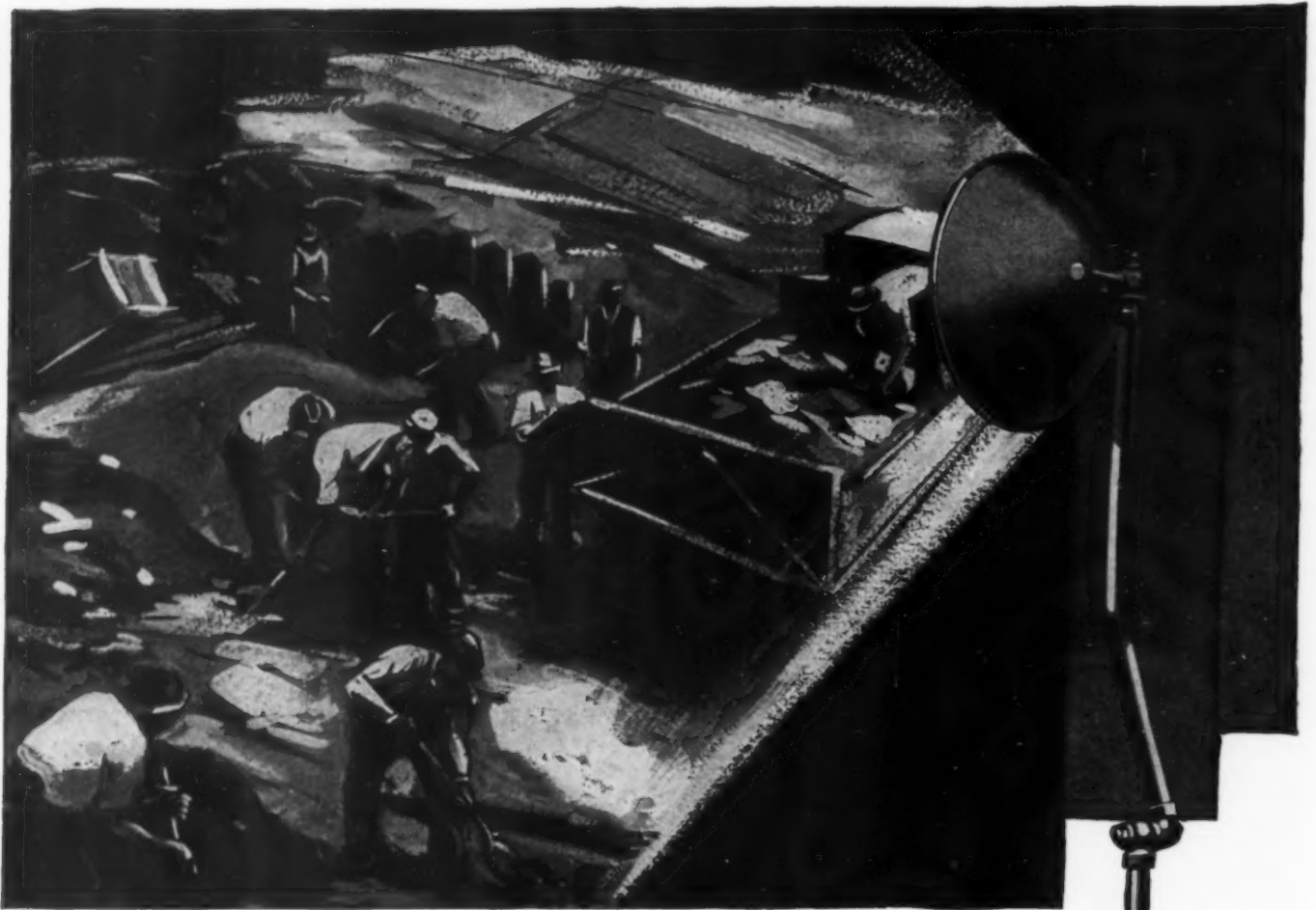
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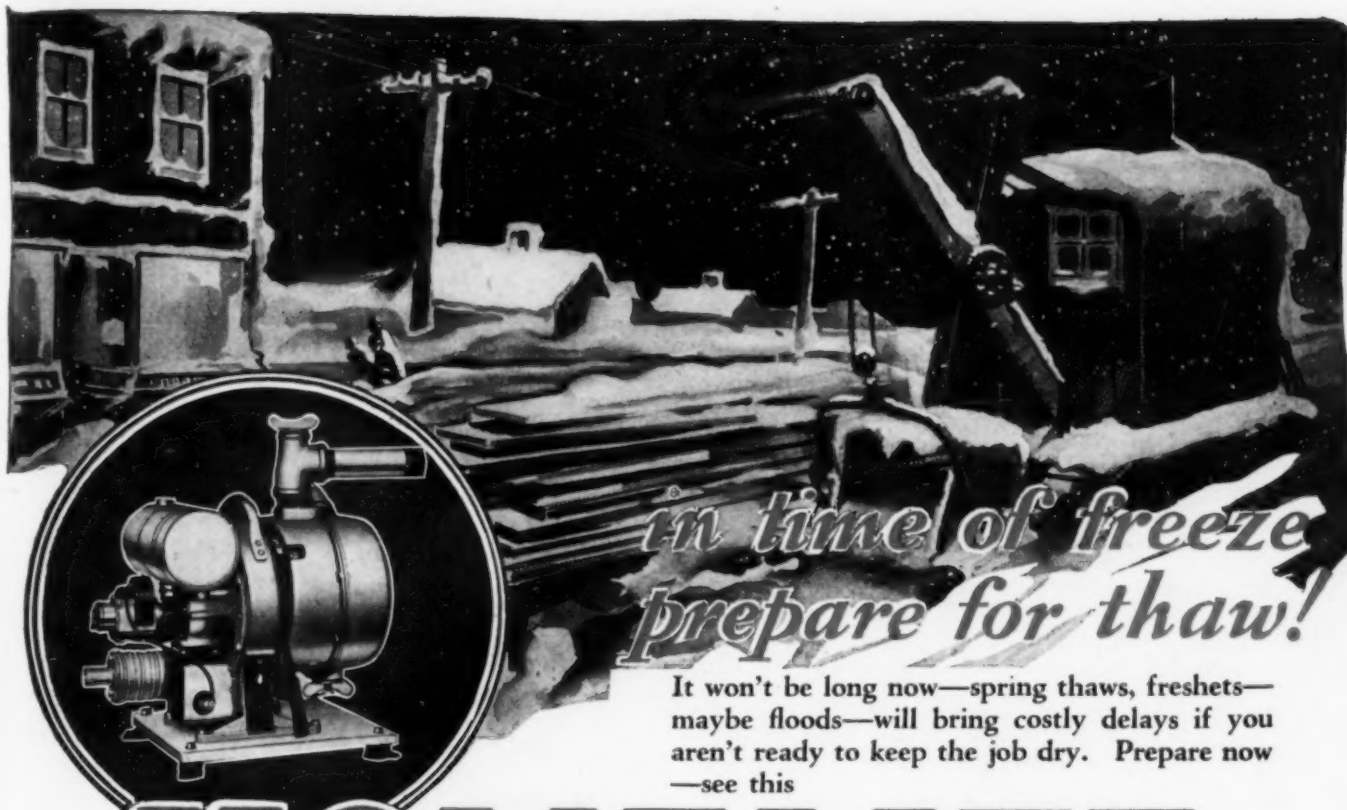
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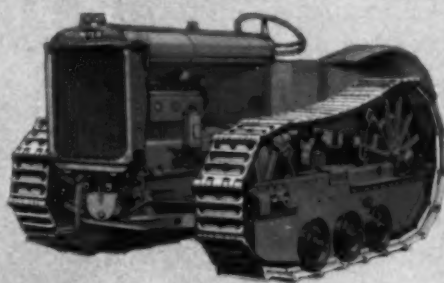
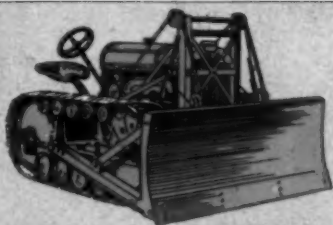
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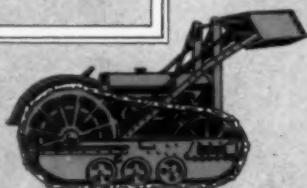
United Bulldozer
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Trackson Company



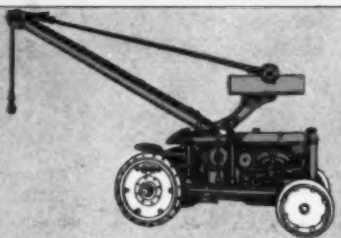
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Center Control Grader
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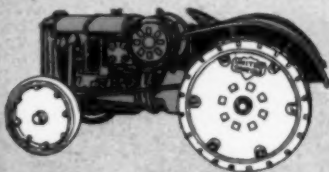
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BRINGS EXCEPTIONAL LOW-COST
PERFORMANCE TO EVERY JOB

OUTSTANDING performance is assured when the proven ability of UNITED Industrial Equipment is coupled with the revolutionary power and stamina of the UNITED Industrial Tractor.

Every piece of equipment in the UNITED line is specially designed by a leading manufacturer to give exceptional results. It is so constructed that it is actually *built-into* the tractor—resulting in greater strength, durability and convenience of operation, making possible a wider range of usefulness.

Never before has such a unified line of equipment been available to every road builder and contractor. Never before has such economy in initial and operating costs been possible. Learn how this masterful line of equipment will enable you to do better work with less expense. Investigate!

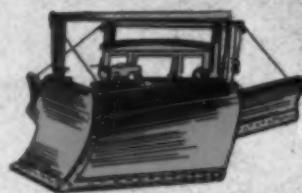
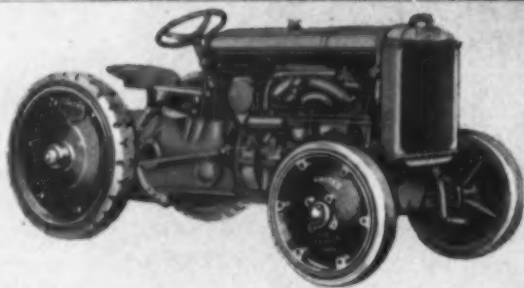
UNITED TRACTOR & EQUIPMENT CORP.

612 NO. MICHIGAN AVE.



CHICAGO, ILLINOIS

See the UNITED Line at the Atlantic City Road Show—January 13-18



United Snow Plow
Built by
Maine Steel Products
Co.

UNITED PERFORMANCE

MEETS THE MOST EXACTING DEMANDS
FOR RUGGED, ECONOMICAL POWER

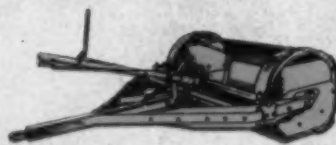
HERE is the tractor that Industry demanded . . . the UNITED . . . built by Allis-Chalmers to provide contractors and road builders with a low-cost power unit that stands the gaff and saves hours and dollars on the most rushed and difficult jobs.

The engineering knowledge of a half-century has gone into the design of the UNITED Industrial Tractor. Built along modern automotive lines, it will supply greater power (official tests show 24 h.p. on the drawbar and 35 h.p. on the belt), and take more abuse than you'll ever require of it.

Adapted to the widest possible range of work, the UNITED, in either wheel or crawler type, provides sturdy, economical power for the complete line of UNITED operating equipment.

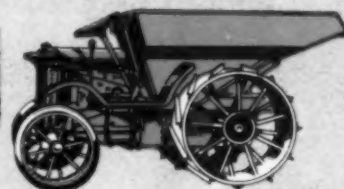
Your UNITED Dealer is prepared to demonstrate how UNITED gives you greater returns for your investment! Write for details.

United Roller
Built by
Wehr Company

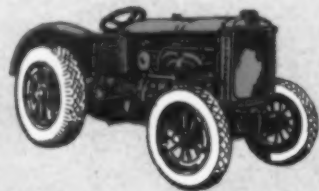


United Scraper
Built by
Perry Company

United Iron Mule
Built by
The Hughes-Keenan
Co.

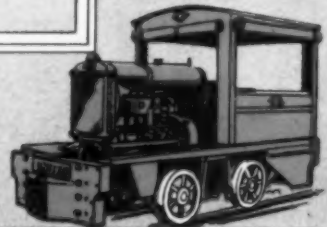


United Power Shovel
Built by
Universal Power Shovel
Co.



United Industrial Tractor
With Pneumatic Tires
Wheels Manufactured
by French & Hecht, Inc.

United Locomotive
Built by
Brookville Locomotive
Co.



UNITED TRACTOR & EQUIPMENT CORP.
612 NO. MICHIGAN AVE. CHICAGO, ILLINOIS



MANUFACTURING MEMBERS

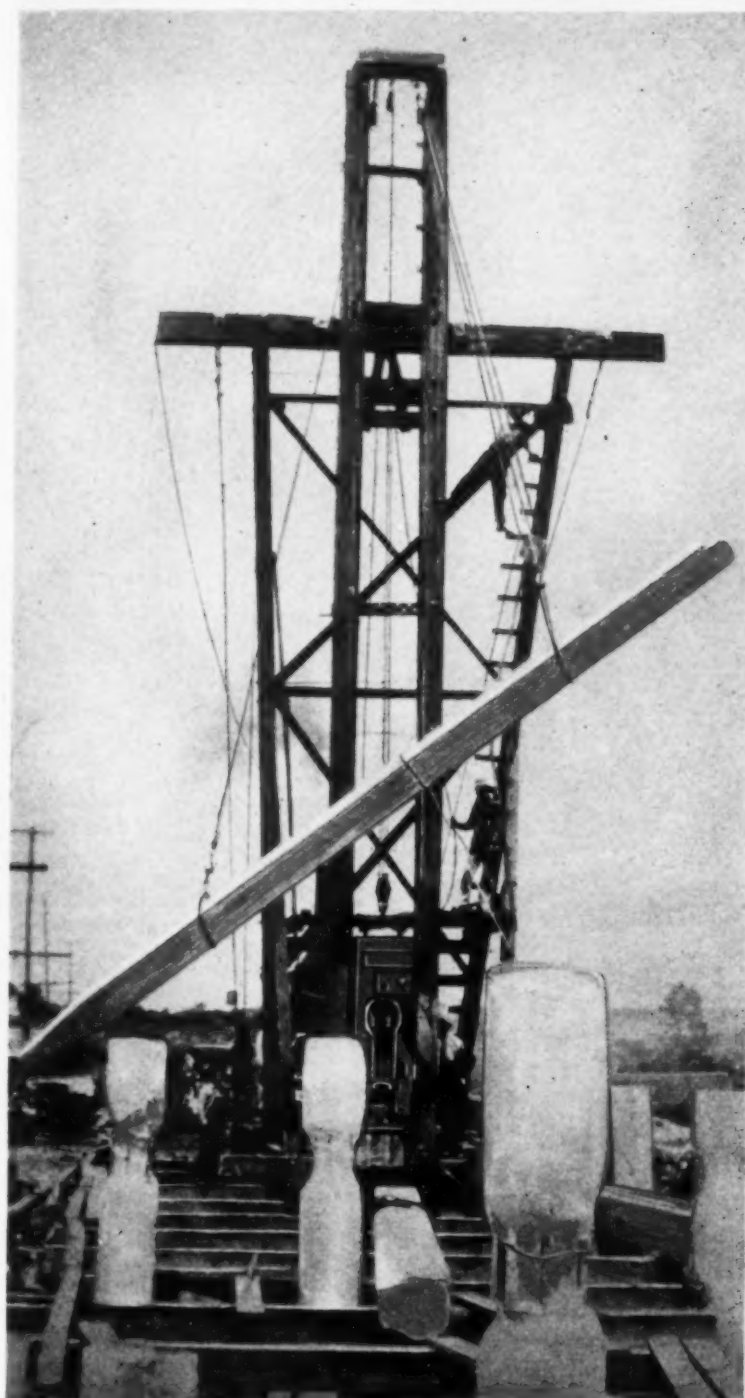
Allis-Chalmers Mfg. Co.
Brookville Locomotive Co.
Detroit Harvester Co.
Dorsey Brothers
French & Hecht, Inc.

Maine Steel Products Co.
Muskogee Iron Works, Inc.
Northwestern Mfg. Co.
Perry Company

Schramm, Inc.
The Hughes-Keenan Co.
Trackson Company
Universal Power Shovel Co.
Wehr Company

See the UNITED Line at the Atlantic City Road Show—January 13-18

IF YOU WANT TO
SPEED UP YOUR
PILE DRIVING WORK



DRIVE

with

UNION HAMMERS

Reports are constantly coming in from contractors bearing witness to this fact. Here on this job, for instance, driving 35-ft., 18-in. square, concrete piles for a bridge, the contractor wrote that his size 1 Union Hammer handled the work with the "greatest satisfaction."

Why not safeguard your profits on jobs where pile driving is required by using these famous double-acting hammers?

They are made in 10 sizes, for driving and pulling the heaviest piles or lightest sheeting. Tell us about your work and let us recommend the size best suited to your needs.

UNION IRON WORKS

Engineers and Manufacturers

Lackawanna Siding Hoboken, N. J.

Agents in Principal Cities

European Agents—

Lidgerwood Limited, Friars House, London

1930 Convention & Road Show,
A.R.B.A., Atlantic City, N. J.
Jan. 13-18

UNION

DOUBLE-ACTING

PILE HAMMERS

OSGOOD PIONEERED



**IN SIX CYLINDER
Power**

Osgood built the first revolving shovel 1890—was the first to use steel castings for all parts subjected to strain—first to use the six cylinder engine—and will always be the leader in this field.

THE OSGOOD co.
MARION-----OHIO

BEHIND THE MOST PROFITABLE JOBS

LOOK FOR BUTLER *Steel BINS*



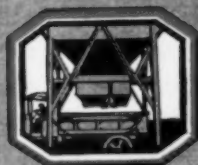
Type "V" — 36 cu. yd.
Road Builders' Bin with
Weighing Batcher.



A 6 Compartment — 215 cu. yd. Central Mix-
ing Plant with 2 yd. mixer. Arranged for han-
dling two brands of bulk cement by means of
bucket elevators and screw conveyors.

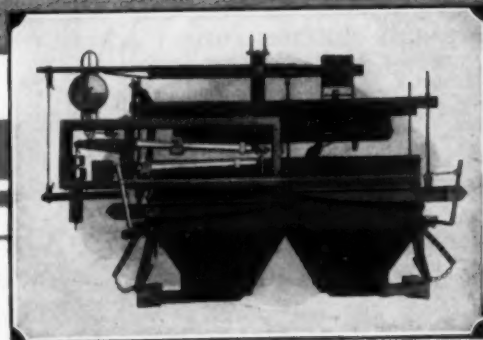


A Bulk Cement Unloading, Stor-
ing and Proportioning Plant for
Road Construction.



BUTLER
Steel BINS

A Butler Multiple
Compartment Weighing
Batcher.



**SEE THEM AT
Atlantic City
ROAD SHOW**

Space 231 — Main Floor

With all the many new
developments in construc-
tion equipment, Butler
Bins have stayed ahead of
the field.

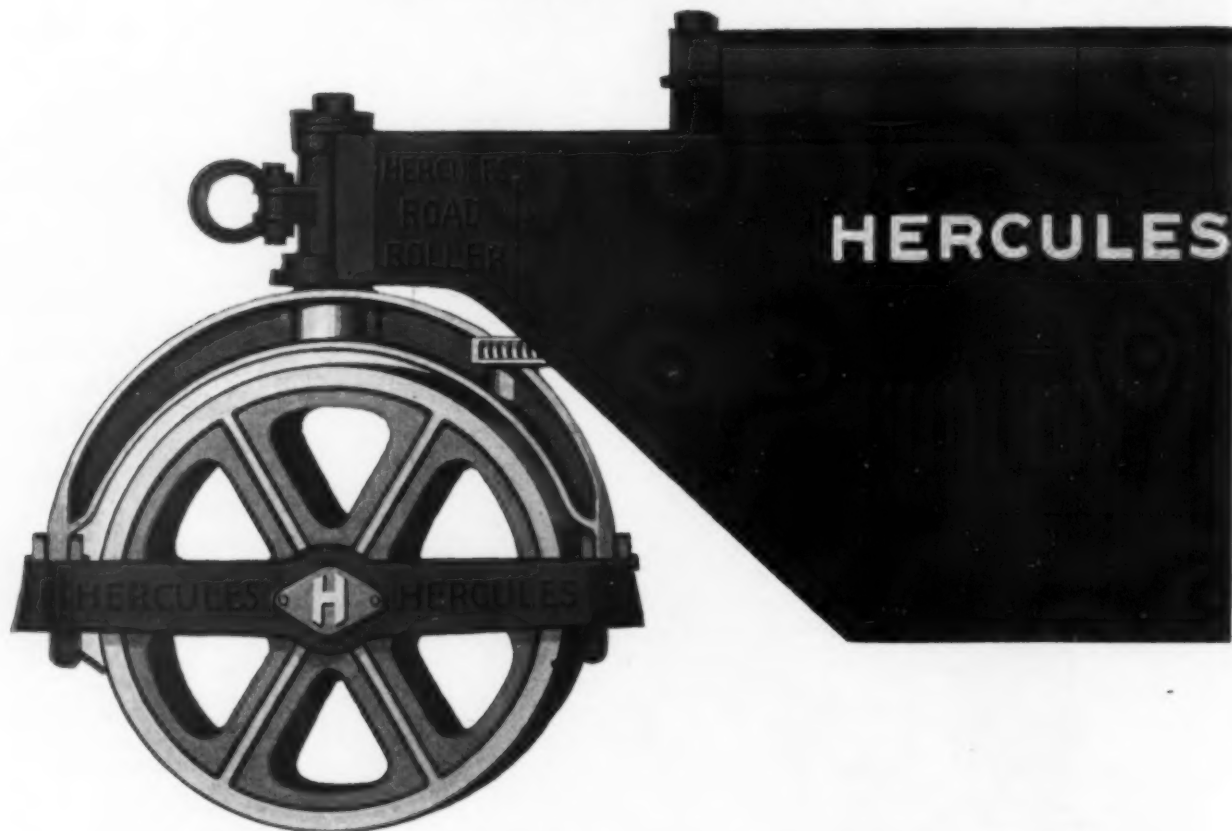
There will be new things
to see in the Butler line
at Atlantic City. Don't
miss this opportunity of
checking up on what's
latest in bins.

BUTLER BIN COMPANY
Waukesha, Wis.

And Now

HERC

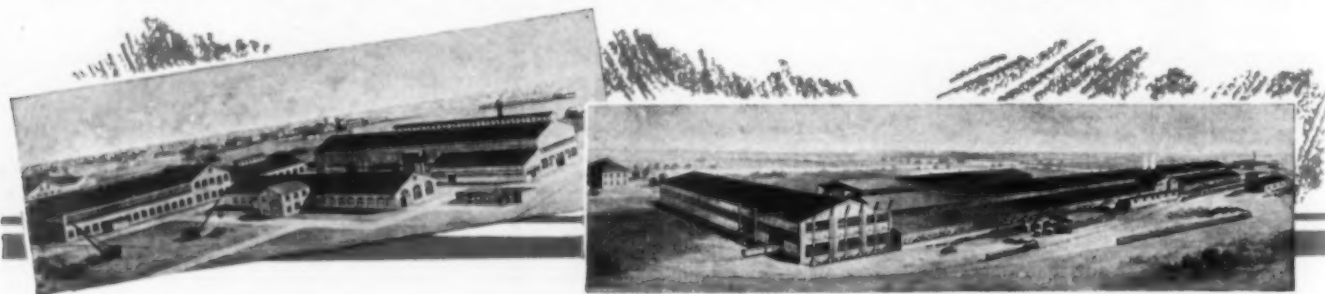
The Perfect



OUT of the experience of State Highway Engineers, Road Contractors, Machinery and Equipment Distributors, and two of the industry's most famous engineers comes Hercules—the Super Road Roller. Built to correct the inherent faults found in most rollers, it is the outstanding development in the field of contractor's machinery.

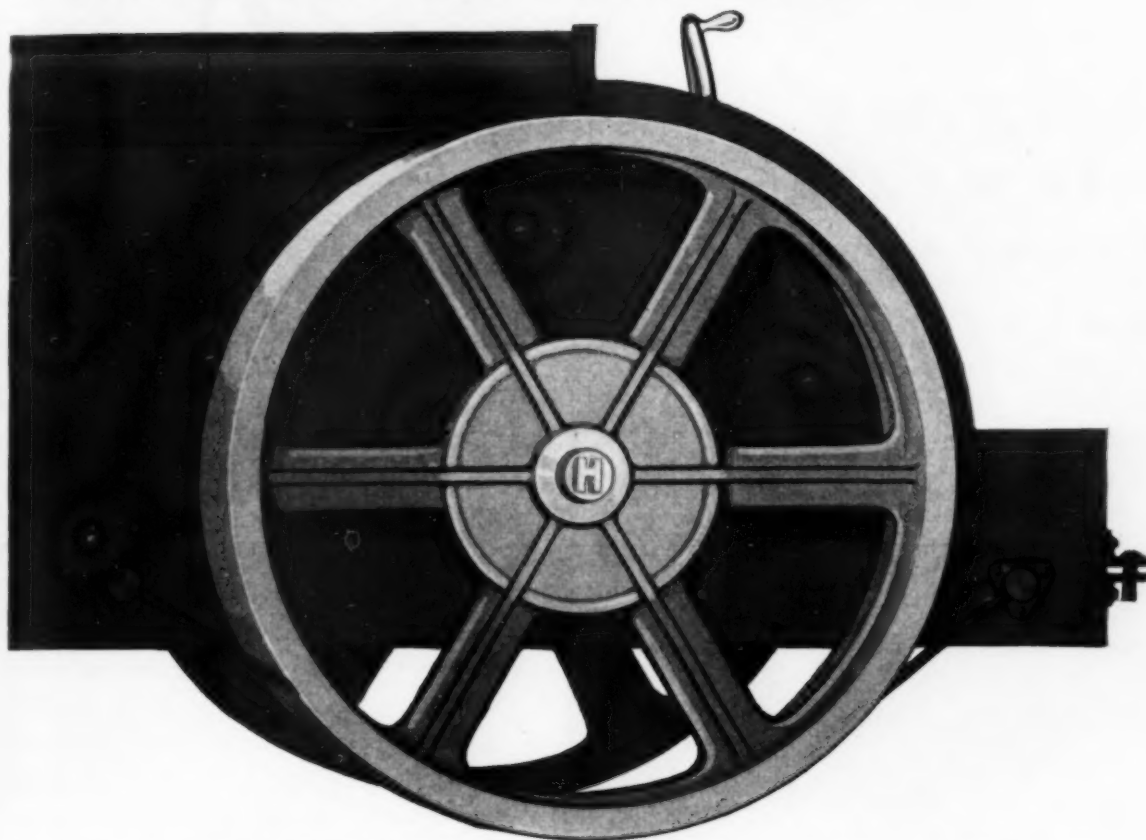
Powerful, rugged and massive, it handles as easily as the finest motor car. Built of steel throughout—with the exception of the engine cylinders—it will give long uninterrupted service and many years of economical usefulness. Flexible and mobile, it has three speeds forward and three speeds backward—low speed $1\frac{1}{2}$ miles per hour—intermediate 3.2 miles per hour—high speed $5\frac{1}{2}$ miles per hour. This means fast work on all rolling jobs whether on sub-grade or surface. And it also means quick transportation between jobs.

Powered with a six-cylinder motor with ample reserve means smooth reversing and quick movement on grades. The high travel speed and surplus power makes it an ideal tractor. All gears and clutches run in a bath of oil housed in a cast steel dust-proof transmission-



HERCULES

Road Roller



differential case. Close to fifty ball and roller bearings insure smooth operation without friction or "freezing."

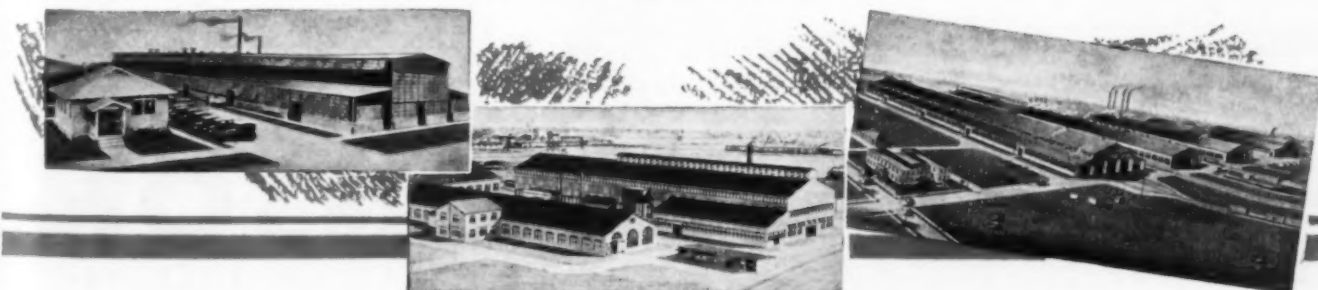
Weight uniformly distributed and wheel pressures in accordance with the requirements of the several State highway specifications. Well balanced and machined to close metric tolerances.

Manufactured by one of the oldest producers of road-building machinery—fifty years successful experience in this field—five large plants well equipped and well manned and served by four trunk line railroads. The Hercules is the greatest single advance in road-building equipment since the advent of the revolving power shovel.

See it at the Road Show—Atlantic City, January 13 to 17, 1930. Booth Number 318.

THE HERCULES COMPANY, MARION, OHIO

Subsidiary of The Osgood Company



STOPPING THE MISCHIEF MAKERS

with Anti-friction Bearings

Friction losses in Fuller & Johnson engines have been reduced to a minimum. The liberal use of Ball and Roller Bearings wherever practical on the main or gear reduction shafts, has prevented Friction's mischief makers from stealing the fuel's energy. ¶ With the specially designed lubrication system, the

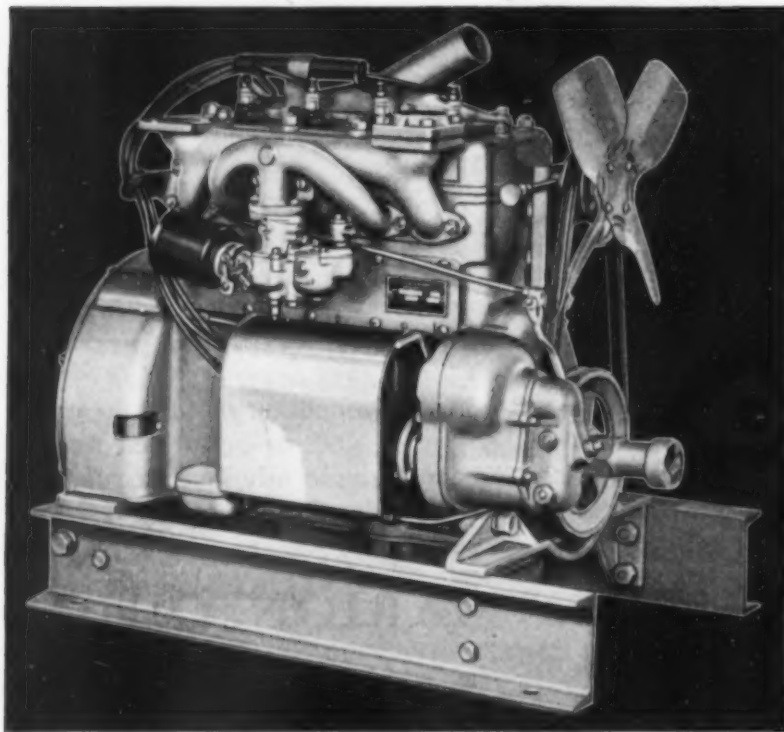


anti-friction bearings require no attention.

¶ The elimination of unnecessary friction is one of the many reasons why Fuller & Johnson engines give more power with less fuel . . . why they give added years of service with lower maintenance cost. Thirty

years of experience in building engines for the most severe service insures correct design and proper construction, resulting in uninterrupted service, a feature of utmost importance to every engine user.

¶ Complete details of the engine illustrated . . . or other Fuller & Johnson power units . . . sent on request. Write Fuller & Johnson Manufacturing Co., manufacturers of single and multi-cylinder—air and water cooled—horizontal and vertical engines, in various sizes. Address: 10 Coma Street, Madison, Wisconsin.



Model "BC" 4-cylinder, 6 hp. to 10 hp. engine.
Can be fitted with Delco-Remy electric starter.

...See you at the
ROAD SHOW
Booth 114, Section A,
Main Floor

FULLER & JOHNSON

ENGINE SPECIALISTS

ESTABLISHED 1840



ONE HAND Lifts Load and All

—with *Blackhawk Hydraulic Power*



Just a few dumped loads pay for a Blackhawk.

WHEN tires go flat don't dump the load. Lift it and the truck too by mere finger pressure. Lower automatically. Keep drivers satisfied, save expense, reduce delays, increase every truck's daily tonnage with a Blackhawk Hydraulic — the modern jack that's three to eight times more efficient than any mechanical jack.

Only a Blackhawk stands up under heavy duty and lowers the cost of jacks and jacking by always giving quicker, easier service — with longer jack life. That's why Blackhawks are standard on Mack and other trucks.

You can do more than lift with Blackhawk jacks — they press, shift and bend. 1 to 75 tons capacity and each a one hand jack.

Write for catalog.

BLACKHAWK MFG. COMPANY
Department CM Milwaukee, Wisconsin

Also world's largest manufacturers of socket wrenches.

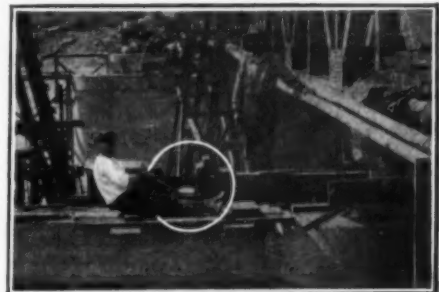
Booth No. 554

at

**Atlantic City
Road Show**



Hand pressure on eight 30-ton Blackhawk Jacks moved this 2093 ton bridge.



HYDRAULIC JACKS BLACKHAWK



"Northern"

More Material at Less Cost

UNITS AND TEAMS FOR ANY USE OR CAPACITY



Universal Belt Conveyor
Complete \$450.00

**ECONOMICAL
SPEEDY
DURABLE**



Another Universal Conveyor
Note Swivel Wheels

THE NEW UNIVERSAL GRAVEL CAR UNLOADER



Operates without *ANY* pit

Loads onto *ANY* conveyor

Conveyor may work at any angle

Handles all loose material

Exceptionally low priced

Large volume **CLEAN** and **SURE**



CAR UNLOADER AND KING CONVEYOR FOR UNLOADING CAR IN 45 MINUTES
TERMS AND OUR 5 YEAR GUARANTEE



NORTHERN CONVEYOR & MFG. CO.
Janesville, Wisconsin

Send catalog of Northern Conveyors
and Car Unloaders.

Name
Address
City

POWER ~ IS WHAT YOU WANT ~C7 HAS IT!



It takes power to break reinforced concrete into chunks like this. Here's the new C7 Paving Breaker tearing down a railroad bridge on Nickel Plate Expansion Program.

Look at the chunk of reinforced concrete the Cleveland C7 Paving Breaker broke off. That takes power! It is the distinguishing characteristic of Cleveland paving breakers.

They regularly save 50% of the cost and 75% in time over hand methods.

Let us demonstrate the unusual efficiency of Cleveland C7 Paving Breakers.

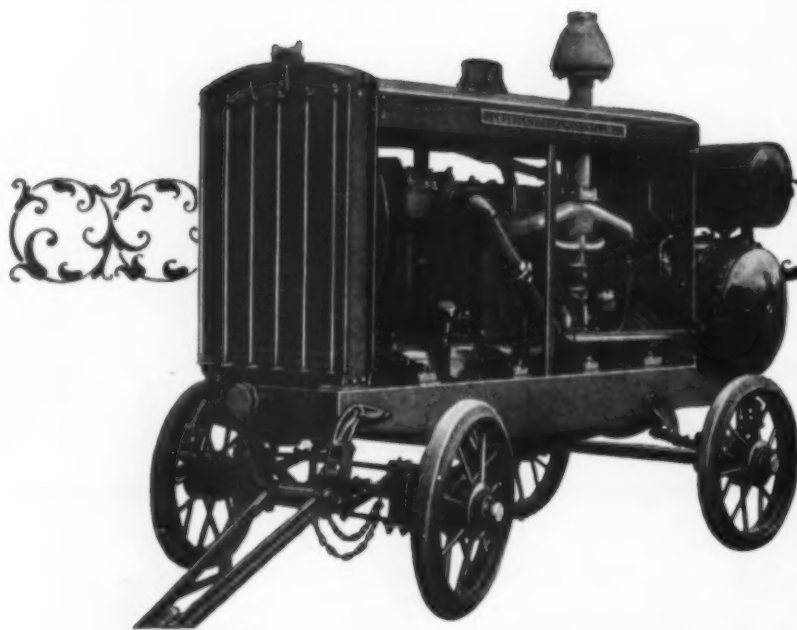
Try Clevaloy Paving Breaker Steels. Our special manufacturing process retains the correct flow lines at the collar. Reduces breakage.



We can't tell you how good Clevaloy is. You wouldn't believe it. But we know it will outlast two ordinary steels.

The Cleveland Rock Drill Co.

3734 E. 78th St. Cleveland, Ohio



THOR Compressors are made in two sizes—the 116 cu.ft. rated capacity size which actually delivers 96 cu.ft. of air; and the 250 cu.ft. rated capacity size which actually delivers 210 cu.ft. of air.

What the **SUPER-CHARGER** of the **Thor SIX AIR COMPRESSOR** Means to You

The most important feature of an air compressor is the amount of air it actually delivers and not its rated capacity. All other features are secondary because air is what you need to run your tools and cut your costs.

The Super-Charger of the THOR SIX Air Compressor is not just "sales talk." It means more air for your money. It means that you can buy the THOR Compressor rated at 250 cu.ft. instead of the usual 310 Cu. Ft. machine and operate just as many tools; or you can buy the THOR Compressor rated at 116 cu.ft. instead of a 160 Cu. Ft. size and accomplish the same results. And this means quite a saving of money to you which is an important consideration.

The Rix Super-Charger is an exclusive, patented feature that enables the piston on its idle or downward stroke to compress the additional air the THOR delivers. And the Super-Charger adds

no complications. It is simple, fool-proof and efficient.

And now for the construction features of the THOR. Look at the photograph above and note its sturdy design—its low slung balance—and its easy accessibility. Note the deep section type cast steel frame which makes a rigid foundation for the unit, eliminating vibration and distortion. The THOR is direct driven—it has no clutches, couplings and gears.

Weigh all of these things in your mind and balance them against other compressors and you will realize why the THOR is the best compressor buy on the market.

On the basis of "more air for your money," the THOR deserves an investigation. The saving in money involved is well worth the time spent. Complete information and specifications are yours for the asking.

Thor Paving Breakers, Clay Diggers and Backfill Tampers are the products of an engineering staff of 37 years' experience in designing pneumatic tools. Write for literature.

INDEPENDENT PNEUMATIC TOOL CO.
PNEUMATIC TOOLS 246 South Jefferson St. ELECTRIC TOOLS
Chicago, Ill.

<See> THE HALF YARD INSLEY

IT is a complete line of convertible half yard excavators—a Shovel for heavy grading—interchangeable into a Ditcher for trenching and basement digging—a Skimmer for shallow street and road grading—a Crane or Dragline. It is built either as a full revolving machine or with 210 degree swing. It successfully covers the field—its standard of quality is high with many features establishing it as outstanding in its class—and its first cost is within the reach of anyone who moves earth.

The Half Yard Insley—both Type "C" and Type "R" will be on display on the Auditorium Stage at the Road Show at Atlantic City, January 13-18, 1930.

The performance of the Half Yard Insleys has shown many men who own shovels that they can make money by using an Insley on a job which is rightfully a half yard shovel job.
You owe it to yourself to see the Half Yard Insley and know its possibilities

*It's
more
than
a
single
machine*

Because the Insley has

Roller and Ball Bearings throughout • Flexible Cone Clutches • Separate Crawler Control • High Operating Speed • Two Traveling Speeds • And many other features • It gives you exceptional performance.



INSLEY



INSLEY MANUFACTURING COMPANY,

Engineers and Manufacturers
INDIANAPOLIS, INDIANA

Division of National
Equipment Corporation

750

**1930
CONVENTION &
ROAD SHOW
A. N. B. A.
ATLANTIC CITY N.J.
JAN. 13-18
BOOTH 211**

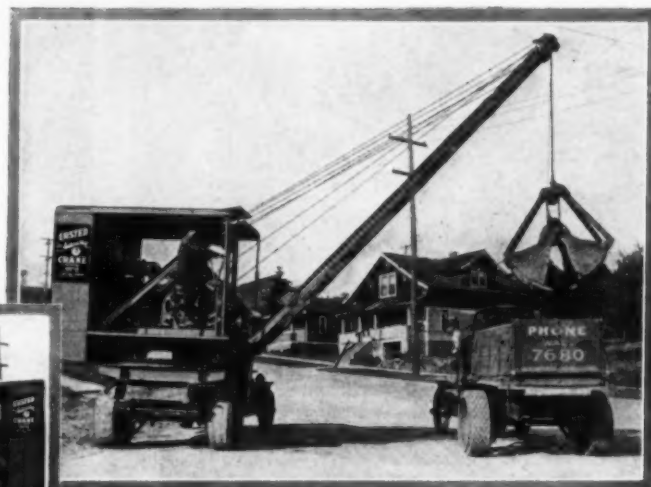
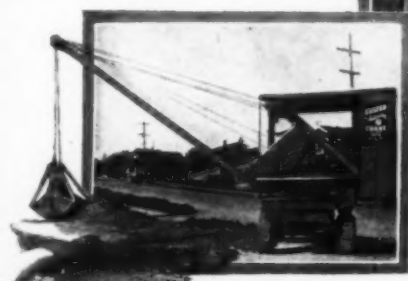
THE 1930 MULTI FOOTE PAVER

for Speed-Service-Success

THE FOOTE COMPANY, INC. OF NUNDA, N. Y.
World's Largest Exclusive Builders of Road Pavers

"Hyster" Truck Crane

does it
for
LESS



Digging, filling, placing pipe,
handling all loose material,
loading trucks and cars



- All steel built
- Full circle swing
- Three speeds

and a price that
makes it profitable
to use a crane

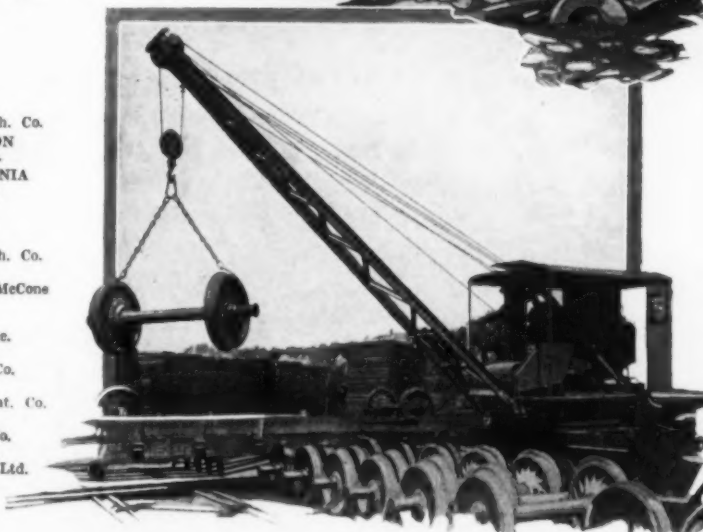
Full ball-bearing automotive construction throughout;
selective gear transmission: gears instantly shifted for light
fast work or heavy slow service.

Ask these dealers for full data

ATLANTA
Evans Implement Co.
BALTIMORE
Albans Tractor Co.
BOSTON
Clark-Wilcox Co.
CHEYENNE
H. W. Moore Equip. Co.
CHICAGO
Tractor & Equip. Co.
CINCINNATI
Queen City Supply Co.
CLEVELAND
W. M. Pattison Supply Co.
DALLAS
Browning Ferris Mach. Co.
DAYTON, OHIO
Queen City Supply Co.
DENVER
H. W. Moore Equip. Co.
DES MOINES
H. M. Brown Co.
DETROIT
Contractors' Equip. Co.

EL PASO
Steel Products Co.
FORT WORTH
Browning Ferris Mach. Co.
HOUSTON
Browning Ferris Mach. Co.
INDIANAPOLIS
W. J. Holiday Co.
LOS ANGELES
Harron, Rickard & McCone
Co.
MINNEAPOLIS
T. W. Rosholt Co.
NEW ORLEANS
Woodard Wight Co.
NEW YORK
H. O. Penn Mach. Co.
OMAHA
H. M. Brown Co.
PHOENIX
Mine & Smelter Equip. Co.
PHILADELPHIA
Service Supply Corp.

PITTSBURGH
Geo. W. Ziegler Mach. Co.
PORTLAND, OREGON
Industrial Equip. Co.
RICHMOND, VIRGINIA
Virginia Tractor Co.
SALT LAKE CITY
Landes & Hyde Co.
SAN ANTONIO
Browning Ferris Mach. Co.
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Harron, Rickard & McCone
Co.
SEATTLE
A. H. Cox & Co., Inc.
SPOKANE
Construction Equip. Co.
ST. LOUIS
Liggett Equip. & Mat. Co.
TOLEDO
Contractors' Mach. Co.
VANCOUVER, B. C.
National Mach. Co., Ltd.



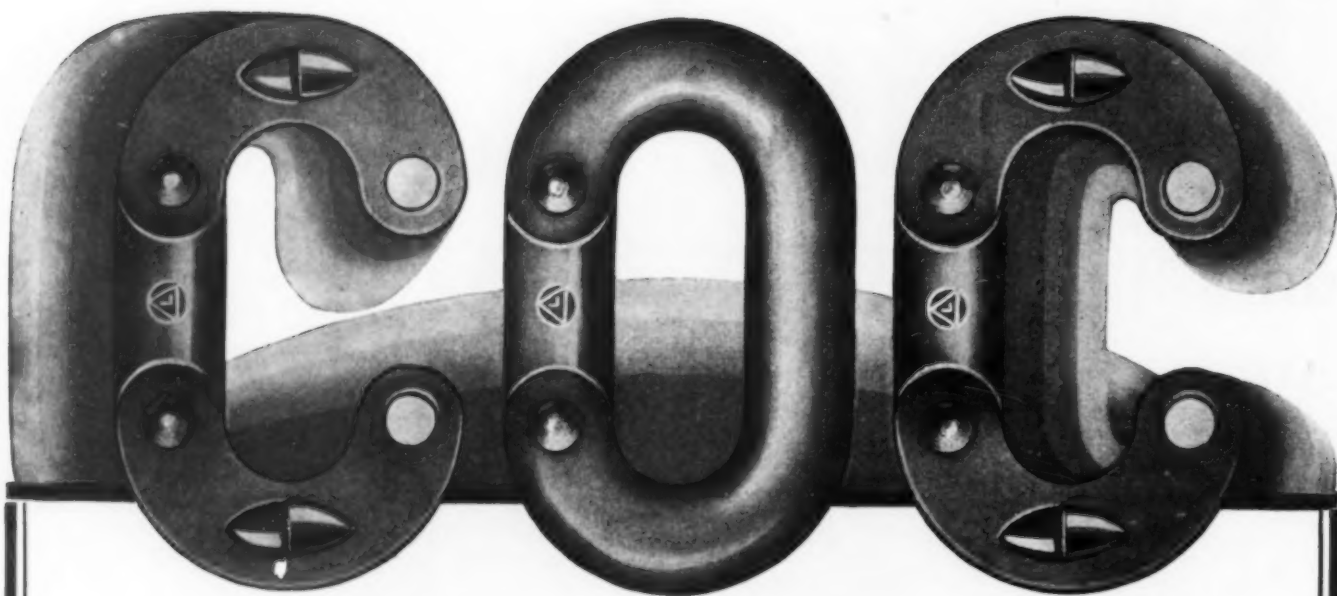
WILLAMETTE-ERSTED

PORTLAND
OREGON

COMPANY

PEORIA, ILLINOIS
837 South Washington St.

New York City
126 Liberty St.



THE ORIGINAL

Missing Link

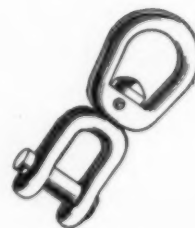
THE GENUINE



Of drop forged steel and great strength. Note the interlocking lugs and the big husky rivets.



Time on a job is money. Use MISSING LINKS and save time. Sizes $\frac{3}{16}$ " to $1\frac{7}{8}$ ". Sizes 1" and larger have reinforced rivet holes. Look for the Laughlin trademark.



The **THOMAS LAUGHLIN COMPANY**

182 Fore Street, PORTLAND, MAINE

Wire Rope Fittings \ Drop Forgings \ Marine Hardware

NEW YORK — CHICAGO — SAN FRANCISCO — SEATTLE — LOS ANGELES

Here it is...

A brand new Le Roi 4 Cylinder Engine . . . that is compact and sturdy, a job capable of developing a maximum of horsepower under capacity load . . . unquestionably the acme of engineering skill . . . that's Le Roi's newest triumph in gasoline engine design.

Think of it... this new engine is ball bearing equipped... it will develop 7-12 h. p. This engine is lighter in weight than two cylinder models of less horsepower, while it is small in size, still it has all the elements of strength and power. And with all this, it will be placed on the market in the range of 2 cylinder prices. Let us send you complete details.

LE ROI CO., Milwaukee, Wis.

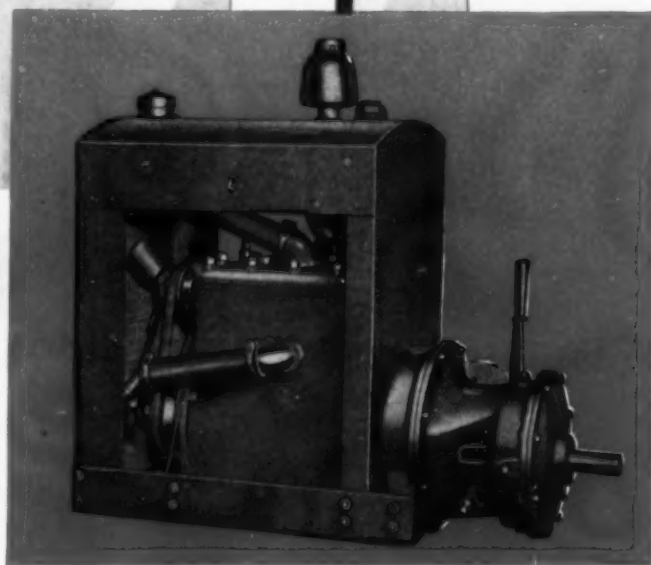
The New LE ROI

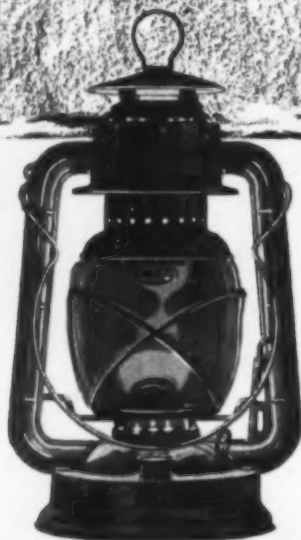
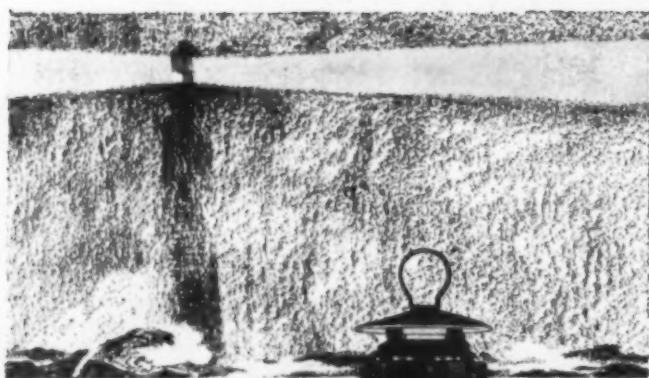
4 CYLINDER ENGINE

**BALL
BEARING
EQUIPPED**

**A 4 CYLINDER
ENGINE IN THE
PRICE RANGE
OF A 2**

LE ROI ENGINES
for dependable power!





DIETZ NO. 2 D-LITE (COLD BLAST)

**SHORT GLOBE LANTERN OF
HIGHEST LIGHTING POWER**

Use
RED!
No
other
color
means
danger

LIKE lighthouses in a stormy sea Dietz Red Lanterns protect the traveling public from the pitfalls along upturn highways. No other warning lights are so universally understood and obeyed—none are so economical.

Where large lanterns of highest lighting power are required for roadside warning Dietz Cold Blast No. 2 D-LITE Lanterns are a logical choice.

R. E. DIETZ COMPANY

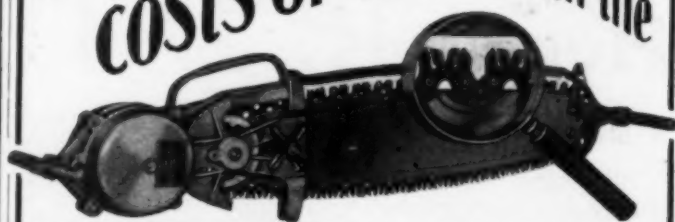
NEW YORK

Largest Makers of Lanterns in the World

FOUNDED 1840



**Cut your handsawing
costs of 1930 with the**



WOLF Portable Timber Sawing Machine

Electric Drive

A.C. 110 and 220 volt, 60
cycle, 3 phase.
D. C. 115 and 230 volts.

Air Driven

Ingersoll-Rand or
Chicago Pneumatic Air Motors



Cutting
12" x 16"
Hard Pine
in
55 seconds

(Fiske Carter
Construction
Company,
Worcester,
Mass.)

Under Water Service . . .

by Air Driven Model—see photo below—successfully serving to any depth in which divers can operate. (Greiling Eng. Co. of Green Bay, Wisc.)

Thoroughly
proven . . .
Over 360
Wolf Saws
now serve
many fields
of endeavor—

Railroad
Mining
Marine

General Construction, etc.

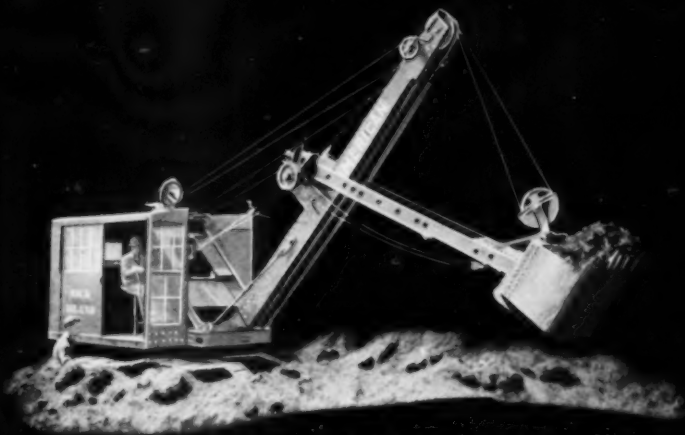


(Names on request)

REED-PRENTICE CORPORATION

Worcester, Mass., U. S. A.





THE NEW GOPHER

Write for the
GOPHER BOOK

FEWER PARTS

Lower Center of Gravity,
therefore, Less Weight:
Lower Upkeep: Greater
Ease of Operation.

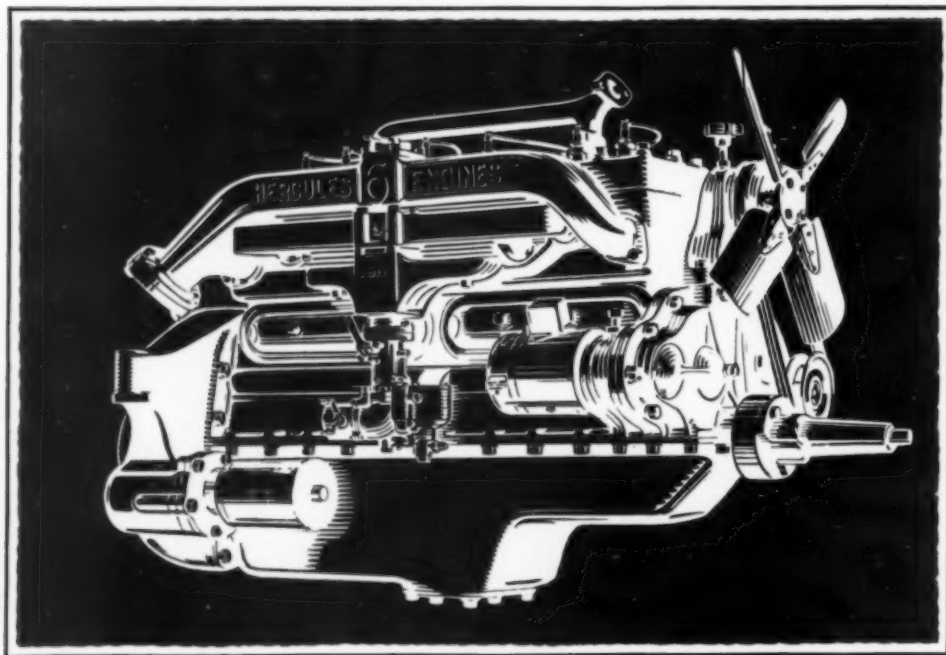
MORE YARDS
PER DAY

* Quality Engineering *

AMERICAN HOIST & DERRICK CO.

ST. PAUL, MINNESOTA

SEE HERCULES ENGINES



AT THE ROAD SHOW

TO ALL users of power equipped road building and road maintenance machinery, the exhibit of the Hercules Motors Corporation at the A. R. B. A. road show promises greater interest than ever before.

You are cordially invited to see the display of Hercules Engines and Power Units in Space 234—and to inspect the wide variety of contractors' machinery embodying Hercules Engines as standard power.

Hercules-Powered machines will be exhibited by leading manufacturers of Compressors, Cranes, Crushers, Draglines, Graders, Hoists, Loaders, Locomotives, Mixers, Pavers, Pumps, Rollers, Scrapers, Shovels, Trucks, Trenching Machines, Tamper Back-fillers and other heavy-duty equipment.

HERCULES MOTORS CORPORATION

Canton, Ohio, U. S. A.

WEST COAST BRANCH: LOS ANGELES, CAL.
MID-CONTINENT BRANCH: TULSA, OKLA.

HERCULES ENGINES

FACTS ON AIR KINGS



ROAD BUILDERS!

You will be interested to know that a working model of the world's finest Portable Air Compressor—the M-W “AIR KING”—will be displayed in BOOTH No. 301 at the American Road Builders' Convention at Atlantic City.

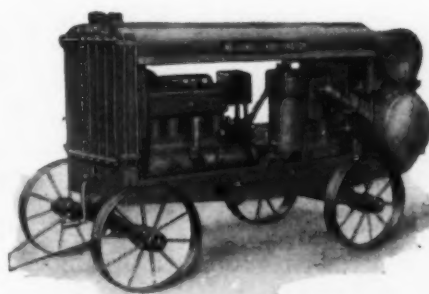
This machine embodies the most advanced engineering features in Portable Air Compressors—full Forced Feed Lubrication, Feather Valves, Indestructible All-Welded Frames, Heavy-Duty Engine, Super-Energy Magnetos, Gasoline Gauges and Strainers, and an over-all efficiency that places it in a class by itself.

Be sure to see the “AIR KING” at the Road Show!

METALWELD, INC., 26TH AND HUNTING PARK AVE., PHILADELPHIA
Dealers in Principal Cities

METALWELD-WORTHINGTON

PORTABLE AIR COMPRESSORS



M-W “AIR KINGS” are available in 28, 110, 220, 280 and 330 cu.ft. sizes, mounted as “towabouts”, trailers, motor trucks, railcars and tractors. Catalog on request.



For Tightening Lag Screws

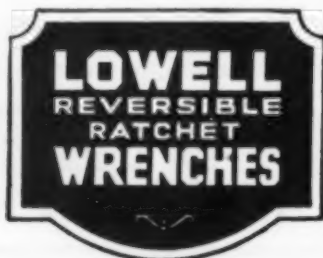
Here's a worth-while short cut that saves time and money when working on heavy timber construction—

Lowell Lag-Screw Wrenches make quick work of nuts. One Lowell in the hand is worth a dozen open end wrenches on the job. Once fitted to a nut, the reversible ratchet feature saves all bother of refitting. Each bolt is pumped home or loosened in a fraction of the time, for pumping is a far quicker operation than refitting.

For over half a century, Lowell Reversible Ratchet Wrenches have been speeding up all jobs on which they have been used. Lag screws step lively when gripped by a genuine Lowell.

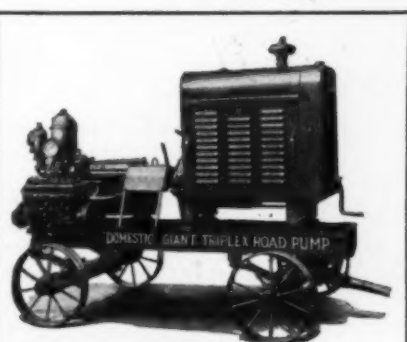
Write for complete catalog R that illustrates and describes the full line. Big special wrenches for special needs.

**Lowell Wrench
Company**
Worcester, Mass.



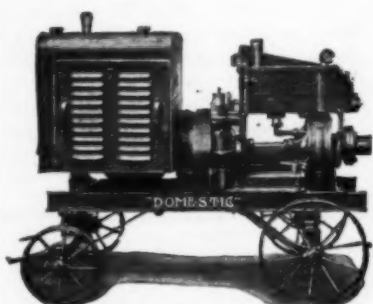


Pumping Equipment for the Road Builder



"Domestic" 500 lb. Pressure Road Pump

Special features: All working parts enclosed—intermediate drive shafts ball-bearing equipped—herringbone teeth gears and all bearings supplied with oil by automatic force feed lubrication.



"Domestic" Automatic Priming Centrifugal Pump

Special features: "Domestic" Automatic Priming Regulator—high efficiency, positive vacuum pump equipped with friction clutch.

1st. High Pressure Water Supply Pumps.

2nd. Large Capacity, Excess Water Disposal Pumps.

These two Pumps are designed and built especially for Contractors and Road Builders. The parts which go into them are tested thoroughly to insure the downright dependability so necessary when fighting against time and bad weather.

"Domestic" Triplex Road Pump

Designed expressly for water supply purposes, these pumps will deliver an ample quantity of water for paver, concrete curing and all other needs of the Road Builder.

This line of 'Triplex Pump Units consists of three different capacity outfits, namely, 60, 80 and 100 gallons per minute and for pressures up to 500 lbs. at the Pump.

"Domestic" Automatic Priming Centrifugal Pumps

A dewatering pump of large capacity that will prime itself and automatically maintain its prime whenever there is enough water to seal and fill the suction line.

On bridge abutment work the Road Builder will find this type of pump a great saver of time and money.

Built in several sizes. Capacities from 300 to 1200 gallons per minute.

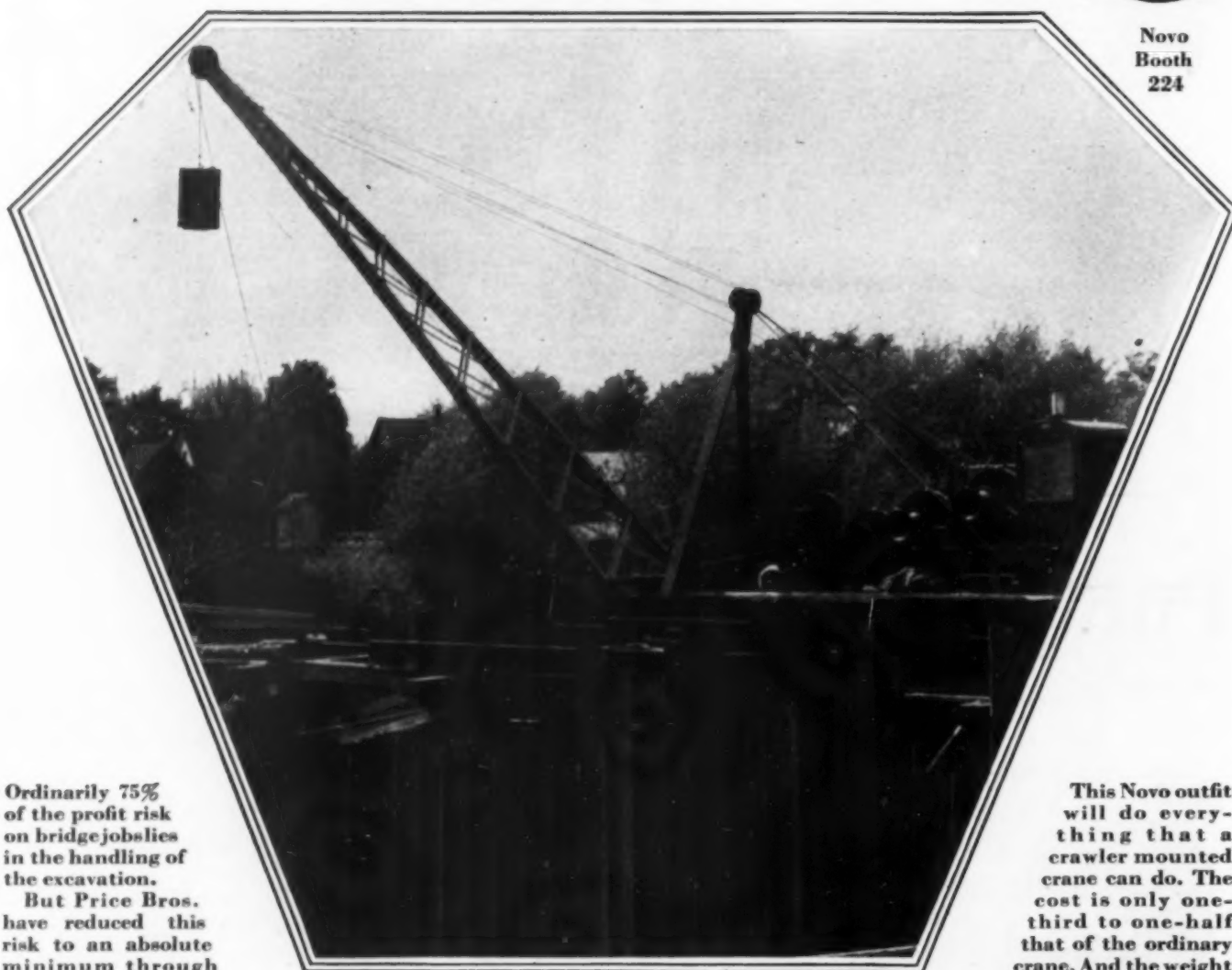
DOMESTIC ENGINE & PUMP CO.
Shippensburg, Penna.

BETTER THAN A CRANE

at $\frac{1}{3}$ the Cost



Novo
Booth
224



Ordinarily 75% of the profit risk on bridge jobs lies in the handling of the excavation.

But Price Bros. have reduced this risk to an absolute minimum through the use of a Novo triple-drum DH hoist with boom swinger.

The rear or high speed drum of the hoist is 18" in diameter and is used for pile driving.

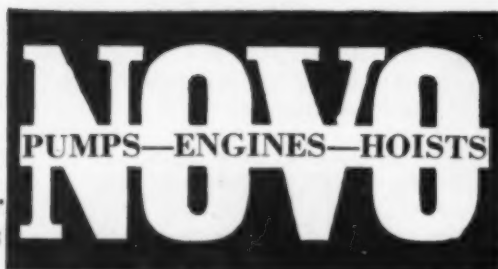
The two front drums are 12" in diameter and are used for handling the clam shell inside the coffer dam. Slow digging is advisable so that it will not tear up the coffer dam sheeting.

Novo Triple Drum Hoist with boom swinger handling pile driver—being moved across false work on the Price Brothers' bridge job at Bellevue, Mich.

This Novo outfit will do everything that a crawler mounted crane can do. The cost is only one-third to one-half that of the ordinary crane. And the weight of the complete Novo is only 5,200 lbs. as compared to 20,000 and 30,000 lbs. for the usual crawler mounted crane. Because of the light weight, the Novo can work

its way across the stream on the false work supported by the piles which it drives.

The Novo Hoisting Handbook details many construction jobs such as the above. Write for your copy today.



Please send me the Novo Hoisting Handbook.

Name.....

Address.....

NOVO ENGINE COMPANY
214 Porter Street - Lansing, Michigan
Clarence E. Bement, Vice-Pres. and Gen. Mgr.

City.....

State.....

STRUCTURAL STEEL CREATED THE SKYSCRAPER



This is an age of STEEL



ECONOMY and efficiency in construction have made this an age of *steel*. No other building material is so easily adaptable . . . so completely suitable to the modern ideals of strength, safety and savings. Steel has great strength without excessive bulk and weight. It permits lighter foundations and larger interiors with less conspicuous construction members. Steel provides the surest means of rapid building—the most certain saving of labor.

Steel is everywhere making possible a greater refinement in building design. Its immense strength

and permanent security permit a wider scope of imagination in the search for means to express the modern spirit . . . not only in tall skyscrapers and huge bridges, but in small apartment houses, dwellings and small bridges as well.

This is an era of *steel* construction . . . because no other building material is so adaptable, so durable, so suited to present needs and future possibilities.

A Technical Service Bureau is at the disposal of architects, engineers, owners and others who have need of any information which can be supplied through the American Institute of Steel Construction, Inc.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

The co-operative non-profit service organization of the structural steel industry of the United States and Canada. Correspondence is invited. 200 Madison Avenue, New York City. District offices in New York, Worcester, Philadelphia, Birmingham, Cleveland, Chicago, Milwaukee, St. Louis, Topeka, Dallas and San Francisco. The Institute publishes twelve booklets,

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AND SECURITY

one on practically every type of steel structure, and provides also in one volume, "The Standard Specification for Structural Steel for Buildings," "The Standard Specification for Fireproofing Structural Steel Buildings," and "The Code of Standard Practice." Any or all of these may be had without charge, simply by addressing the Institute at any of its offices.

What's Mine is My Own

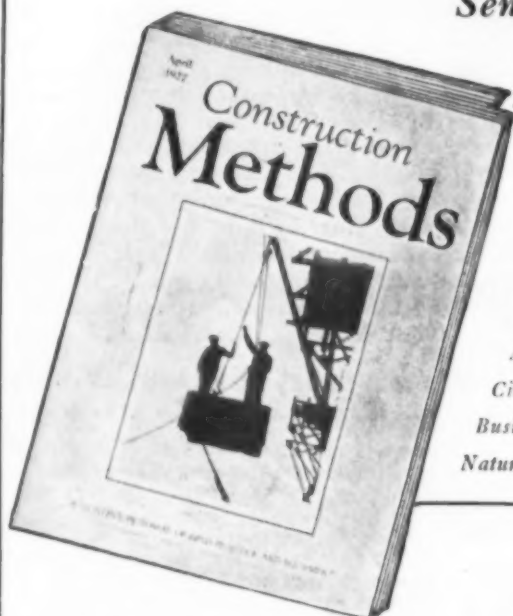
I do with it as I please—when I please—and how I please. I don't have to borrow what's mine—nor must I return it. I share it if I wish—but first and last, it's mine—for my own use.

My copy of *Construction Methods* comes to me regularly each month. It is the field engineer's most valuable means of keeping in touch with the new developments of modern civil engineering and construction. I need it—and I wouldn't be without it. Nor do I want to read it after others have torn out the most interesting articles for their own use. I want the news complete, and I want it while it's new.

When pictures and items are cut or missing—when you see each issue two weeks late, or not at all—when others have used *Construction Methods'* ideas long before you read about them, you are not getting full value, or the help to which you are entitled through this paper.

You need your own copy. Be sure to get it.

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Send me my own copy of *Construction Methods* each month for the next two years. Here's my dollar bill—sent at your risk.

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Nature of Business Title



What a Lot of Hose and It's ALL "CONTINENTAL"

This is an actual photograph of a four-inch Marlo Water Hog and equipped with "Continental" Road-builder Hose and a length of Suction Hose in use on a road job at Keansburg, New Jersey, Angelo Fastiggi, Contractor.

We couldn't begin to photograph all the road jobs on which "Continental" Water Hose, Steam Hose and Suction Hose are giving good service but we know we can satisfy you, Mr. Contractor, just as fully as we did Mr. Fastiggi.

Write our nearest branch for prices and information:

112 West Pratt St., Baltimore, Md.
200 Congress St., Boston, Mass.
885 Niagara St., Buffalo, N. Y.
27 West Illinois St., Chicago, Ill.
203 Perry Payne Bldg., Cleveland, O.
122 So. St. Clair St., Dayton, Ohio

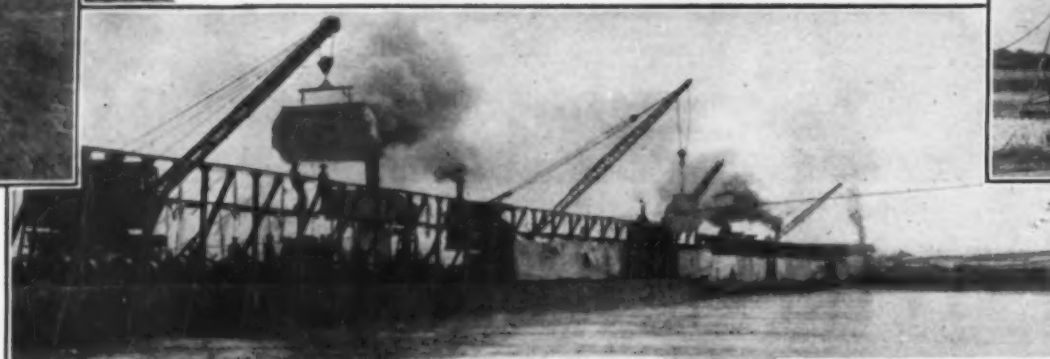
5423 12th St., Detroit, Mich.
6122 Parkhill Ave., Milwaukee, Wis.
152 Chambers St., New York, N. Y.
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CHAS. C. KERNER, 152 Chambers Street, New York, Exclusive Foreign Representative

The Best Equipment Demands

AMERICAN STEEL & WIRE COMPANY WIRE ROPE *On Mississippi River Levee Work*



Construction of the Mississippi River Levee system has called into play practically all known methods of dirt moving, such as draglines, hydraulic dredges, tower machines, etc. On this project all types of equipment are being subjected to gruelling punishment and abnormal operating conditions. And—sharing in this responsibility is American Steel & Wire Company American Wire Rope.

Our wire rope engineers have designed special ropes to fit in with the difficult tasks encountered here. They can help solve your wire rope problems.

American Steel & Wire Company

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208 S. La Salle Street, Chicago
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U. S. Steel Products Co.: San Francisco, Los Angeles, Portland, Seattle, Honolulu
Export Distributors: United States Steel Products Co., 30 Church St., New York City



11 Days Saved

UNDER this caption, in this issue of Construction Methods, is a description of the repaving of Baronne Street, New Orleans. To avoid costly delays and traffic congestion, the New Orleans city officials decided to use "INCOR" Brand Perfected High-Early-Strength Portland Cement. The article says:

"The results fulfilled expectations. The saving is estimated at about 11 days, on the average, as compared with the time it would have been necessary to allow for the setting and curing of a slab in which ordinary Portland cement was used."

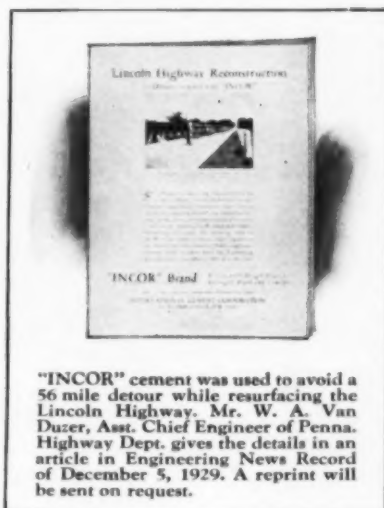
"INCOR" Cement is also being used in the repaving of Canal Street, New Orleans, with its four lines of street railway track and heavy traffic. It is important to note that "INCOR" produces Portland Cement Concrete that is ready to use in 24 hours. No admixtures are necessary; no new methods are required. "INCOR" produces the same kind of dependable concrete as Lone Star Cement, because "INCOR" too is a Portland Cement.

The high-early-strength of "INCOR" brand cement which saves time and

prevents inconvenience to the public means added profits for contractors and engineers.

Contractors save money because "INCOR" permits rapid turnover of equipment for use on other contracts—lowers overhead costs—enables completion of larger contracts during one construction season—makes it possible to place additional mixers on job where pavement is laid in parallel strips—eliminates investment of funds in materials for long periods—reduces number of crossovers and detours that must be constructed and maintained—cuts the payroll by eliminating most of the watchmen necessary on detours—permits hauling of material over finished pavements weeks sooner than is ordinarily possible—shortens curing period—secures earlier and larger estimates for payment because a greater yardage is completed in a much shorter time.

Engineers save money with "INCOR" because the time and number of men required for supervision is greatly reduced and fewer estimates of completed work for payments are necessary.



*Reg. U. S. Pat. Off.

INTERNATIONAL CEMENT CORPORATION



342 Madison Avenue, New York

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One of the world's largest cement producers — 13 mills . . . total annual capacity 21,000,000 bbls.

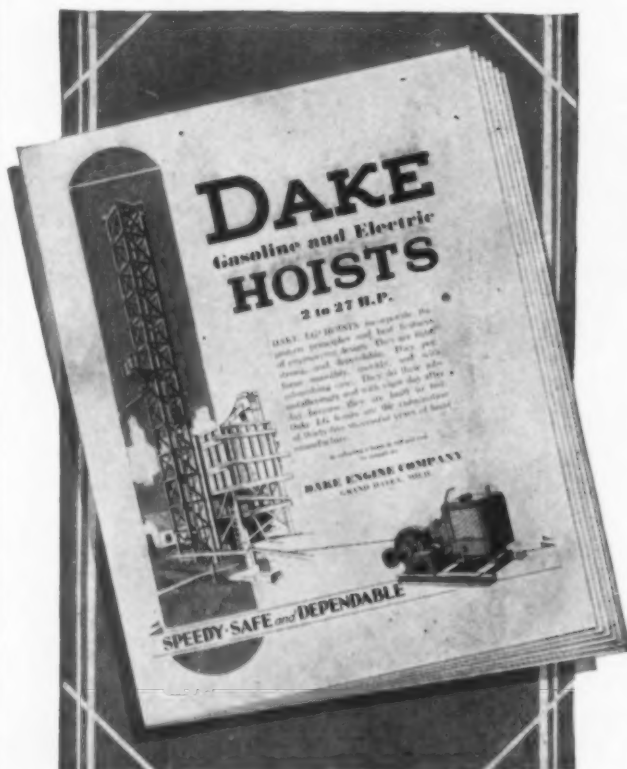
Know Your ROPE

If your equipment requires wire rope of more than ordinary stamina—rope that stands bends as well as heavy loads—that is elastic as well as tough—that will not crush easily—it will pay you to specify Yellow Strand Rope, made of genuine Sheffield-drawn steel wire of Swedish base. Get Catalog 47.

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Yellow Strand WIRE ROPE

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Grand Haven, Mich.

Announcing the New Line

DAKE'S

GASOLINE OR ELECTRIC

S-LG HOISTS

Light
Strong
Dependable

Mail coupon today for Hoist Catalog. It gives specifications, tables, and Hoist details.

Dake Engine Co., Grand Haven, Mich.

Gentlemen:

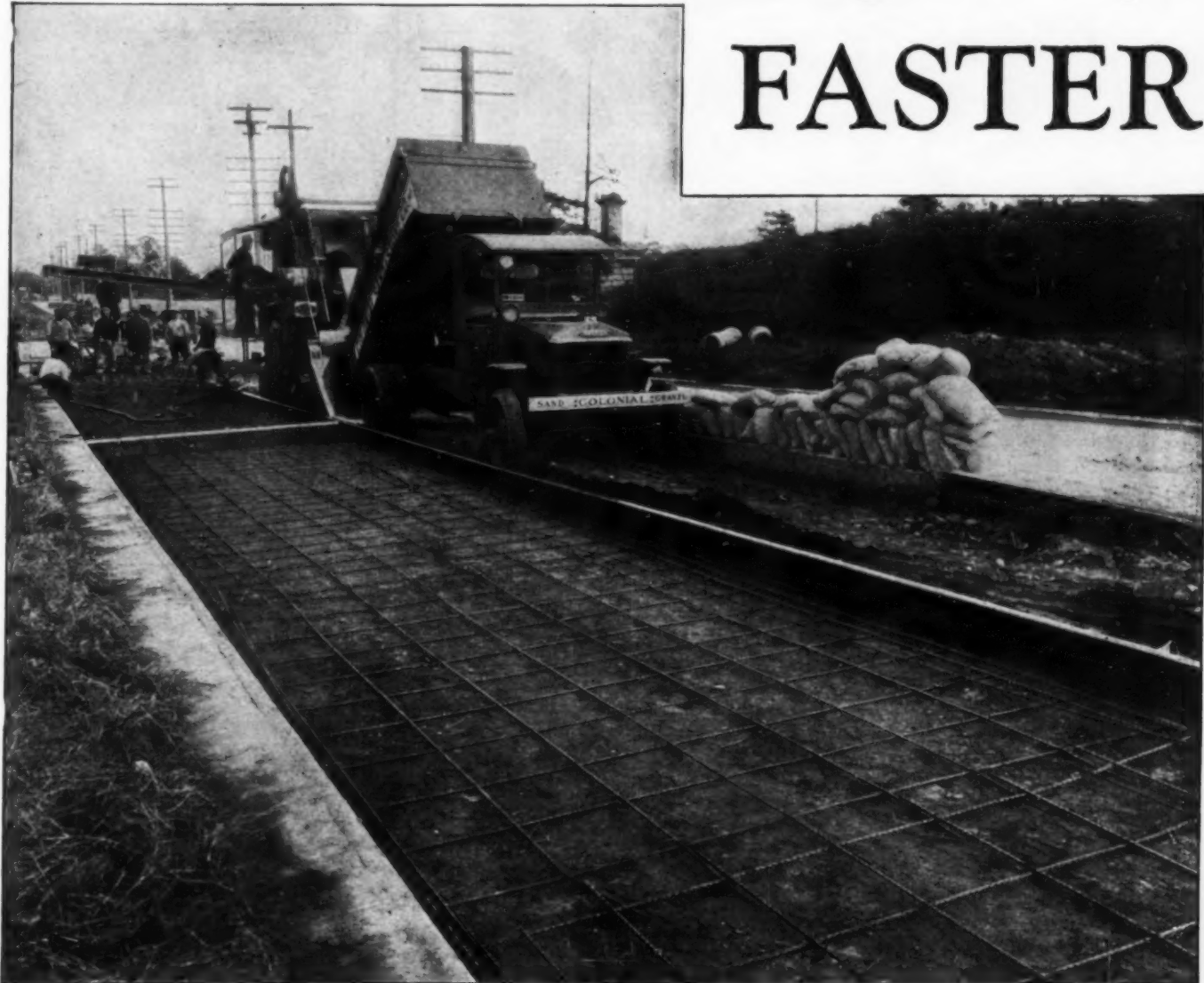
Send copy of your catalog illustrating and describing your complete line of Gasoline and Electric Hoists.

Name

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City State

Making *better* Highways FASTER



The reinforcing mats shown in this photograph are Havemeyer Barmats—strong, rigid, electrically welded units, made ready for immediate use on arrival at job.

Havemeyer Barmats eliminate hand-tying, are easily handled, quickly placed and produce an altogether satisfactory, economical job. They are used for either single or double layer reinforcement.

Havemeyer Barmat Reinforcement is the easiest, fastest, most economical system of road reinforcing ever devised. It helps you make *better* highways and make them *faster*.

Write for copy of our new manual, "Economical Concrete Road Reinforcement."

HAVEMEYER Electrically Welded BARMATS

Executive
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New York

DISTRICT OFFICES: Birmingham, Boston, Chicago, Detroit, Minneapolis, Philadelphia, Pittsburgh, St. Paul, Syracuse, Washington, Youngstown.

Concrete Steel Company



Atlantic
City,
space 111,
Main
Floor.

"IRON MULES"

TWO of these tractor dumps will be exhibited at the Road Show at Atlantic City—the 4 yard with crawler tracks and power hoist, and the 2 yard with new spring mounting.

"Iron Mules" won't merely wish you a prosperous New Year. They'll make you one. "Pulling traction" and the fact that the driver is always facing the load are two of the reasons why Hughes-Keenan "Iron Mules" haul bigger daily yardages at less cost than trucks and teams. In any weather or going.

DUMP BODIES

A FEATURE of the exhibit will be the Hughes-Keenan mechanical power hoist, a powerful and efficient hoist of unique design—that will sell for a remarkable price.

This hoist and the "Iron Mules" together with a number of the rugged, efficient Hughes-Keenan Dump Bodies will make an exhibit worth the time of the busiest contractor. The dump bodies will be in 1 and 1½ yard sizes equipped with hand hoist, gravity dump and mechanical power hoist.

See them. Main floor, space 111. Or mail coupon for illustrated folders.

THE HUGHES-KEENAN COMPANY
MANSFIELD, OHIO

HUGHES- KEENAN Steel Dump Bodies

THE HUGHES-KEENAN COMPANY, Mansfield, Ohio.

Gentlemen:

Please send without obligation your free illustrated "Iron Mule" folder and dump body literature.

Name

Address

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TEAR OUT—MAIL TODAY

"Steel
for
strength
and
security"



Twin 74-inch Lock-Bar Steel Pipe line for Wanaque Aqueduct, North Jersey, the largest steel pipe contract for water supply ever awarded in the East.

The joint that makes steel pipe what it is

There is no substitute for steel pipe.

No substitute for its strength and security.

But when you use steel pipe with a joint which time has not yet proved is equal in strength to the plate itself, you are gambling with the merits of steel pipe. You may or may not get 100% of the strength and security of the steel pipe.

No such question arises when you use Lock-Bar Steel Pipe. During the past 25 years the Lock-Bar Joint has proved in installations everywhere that it is as "strong as the plate itself."

Try to match this record with any other joint!

EAST JERSEY PIPE COMPANY
7 Dey Street, New York City

LOCK-BAR
STRONG AS THE  PLATE ITSELF

A Low-Cost Road ▼ ▼ Program ▼ ▼

The Asphalt Institute urges a national low-cost paved road program as a most effective means of tying in with President Hoover's splendid constructive drive to make national prosperity permanent.



*Asphalt surface-treated sand-clay road near Tallahassee, Florida.
Total cost base and top about \$4,500 per mile.*

Smooth, dustless, mudless, durable, year-round roads capable of carrying a large volume of passenger traffic and a reasonable amount of freight, can be constructed at from \$2,000 to \$10,000 per mile . . . Write for information.

8 Reasons

Asphalt Low-Cost Roads will accomplish these definite national benefits:

- 1 Secure practical Farm Relief.
- 2 Reduce the toll of death and accident on the highway.
- 3 Extensively utilize local materials.
- 4 Tend to prevent unemployment.
- 5 Tremendously speed up the paving of country highways.
- 6 Sharply reduce unit construction cost.
- 7 Stimulate basic industries—particularly the automobile industry.
- 8 Make motoring a real pleasure.

The ASPHALT INSTITUTE

A national institution not organized for profit but for constructive, educational and research activities. Representing 85% in volume of the asphalt producers in the United States and Canada.

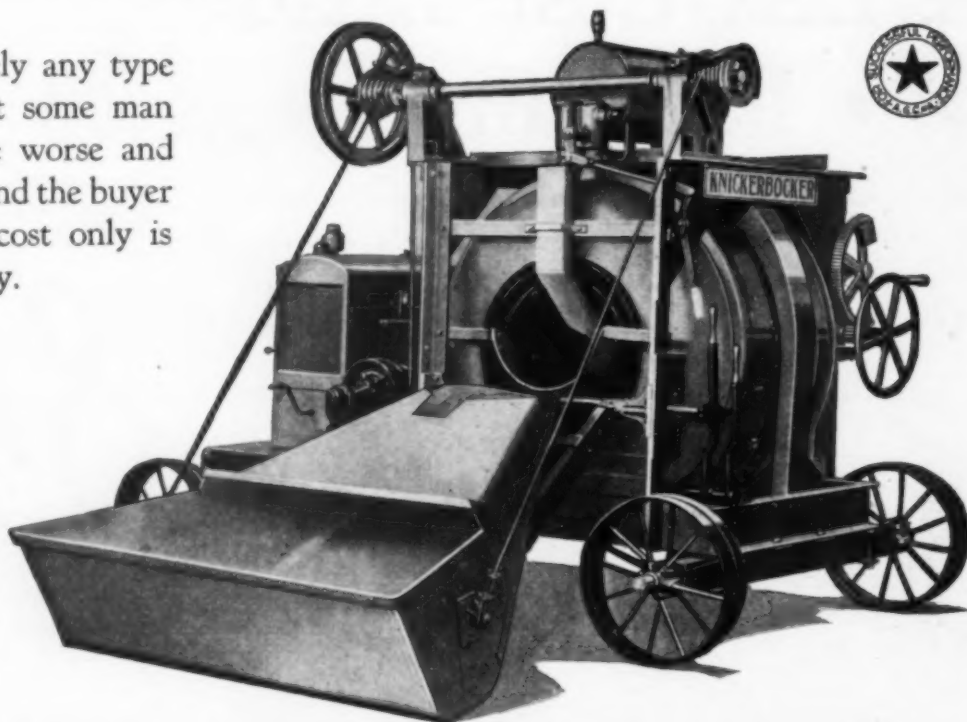
441 LEXINGTON AVENUE, NEW YORK

Visit the Asphalt Institute Booth No. 643 at the Road Show.



THERE is scarcely any type of machine that some man cannot make a little worse and sell for a little less—and the buyer who considers first cost only is this man's lawful prey.

Knickerbocker Mixers are not designed to meet a price, but to mix concrete, mix it well, mix it without interruption, mix it at low cost. They are made in sizes from 3½-S to 42-S. You may see them at the Road Show in Space 333 or we'll be glad to mail you catalogs.



KNICKERBOCKER CONCRETE MIXERS

The Knickerbocker Company, Jackson, Michigan



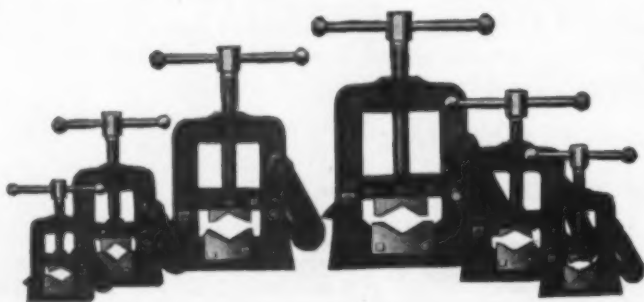
An outstanding vise of many features, two sets of jaws, pipe and machinist vise combined, swivel action—horizontal and vertical swivel base with captive wrench. Will hold pieces of any shape at any angle! Think what that means!

Oswego Tools stand up under hard test

We make a complete line of tools, guaranteed. Our wrenches are justly famous for they stand up well.

Our husky malleable iron pipe vises are adapted to heavy duty service. Get our prices whether you want one or a thousand vises.

Without obligation to you let us send you our catalog, or better still, let us quote you on your next purchase of tools. Write to



The Oswego Tool Company

OSWEGO, NEW YORK

TAKE OFF ONE BATCH TRUCK

Eliminate cement sack loss, the caking of cement on truck bodies and mixer skip. The old practice of dumping cement on top of aggregate—to blow away or be rain soaked—is obsolete.



The Old Way



The Turn-O-Matic Way

**INSTALL
TURN-O-MATIC
CEMENT BOXES
ON YOUR BATCH TRUCKS**

Equip your batch trucks with Turn-O-Matic Cement Boxes. Fill them at the batching plant—from sacks or bulk cement handling plant.

In transit, regardless of weather, cement is always dry. *All of it* reaches the mixer.

At the mixer, lift the box lid. When the batch is released the box turns over depositing the cement on the moving stream of aggregate. Cement does not touch metal of truck body or skip.

Turn-O-Matic Cement Boxes eliminate men to handle sacks, saves truck time, reduces costs—and they're easy to remove when not needed.

Contractors using Turn-O-Matic boxes have been able to take one or more trucks off the job.

Let us explain Turn-O-Matic operation to you in detail.



THE BOX THAT TURNS OVER

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CEMENT HANDLING EQUIPMENT
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Out Performing!

By sheer merit Baker Maney Self Loading Scrapers have held their high place in the estimation of practical dirt movers. By out-performing other equipment in their field, they are forcing their way into the equipment of thousands of contractors and road officials. Their performance speaks for itself.

When you consider that two or three men can move as high as sixty cubic yards per hour with a single Baker Maney outfit, you can begin to see why their performance has brought them into such world-wide use on all kinds of earth-moving jobs. Let us have information on your earth-moving jobs. We will be glad to recommend the proper number of Scrapers and model best suited to your job.

BAKER MANEY Self Loading Scrapers

Model D, 1½ yd., Model G, 1 yd., Model H, ¾ yd.

Another Baker Product

Baker Hydraulic-lift Bulldozers with high lift and floating action are made for attachment to both "Caterpillar" and Monarch Tractors.



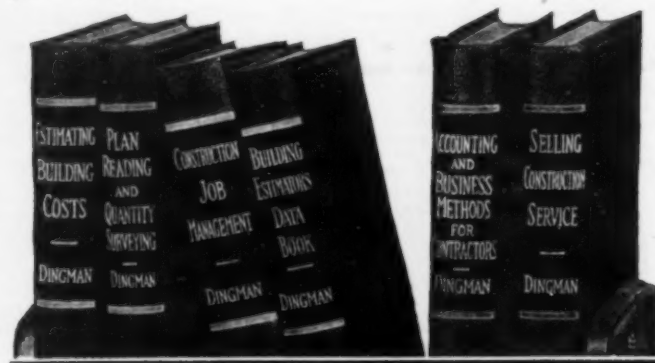
Baker Bulldozer

Write for the following Catalogs:

- Baker Maney Self Loading Scrapers ☐
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THE BAKER MANUFACTURING CO.
568 Stanford Avenue, Springfield, Illinois
See our Exhibit, Road Show, Atlantic City

—for every contractor, engineer and architect who is looking for practical information on everyday construction problems—



The New Dingman Building Contractors' Pocketbook Library

The Dingman books, written from an actual working contact with building problems, have won a wide reputation for their sound, easy-to-understand material. Each one of these volumes is filled with tested methods for saving time, money, materials and labor—and increasing profits. The Library contains:

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240 pages, 114 special tables

On analyzing a construction job into its component parts and covering all jobs from excavation to waterproofing.

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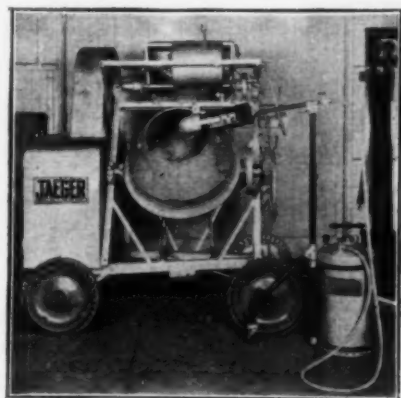
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Send me for 10 days' FREE examination, all charges prepaid, the NEW Dingman Building Contractors' Pocketbook Library in six handy pocket-size volumes. If I find them satisfactory I will send you an initial payment of \$1.50 in ten days and \$2.00 a month until the new special price of \$11.50 has been paid. If I do not want this set I will send it back at your expense at the end of 10 days.

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Home Address
City State
Position
Name of Company C.M.1-30

Hotstuf

TRADE MARK
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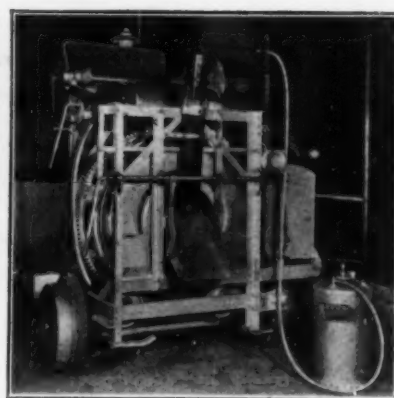
Model S—90 Degree Heat Distributor
Applied to Tilting Type Mixer

UNIVERSAL CONCRETE HEATERS

Have several exclusive
features of importance

See our display at the
Road Show

For all types of Tilting and
Non-Tilting Drum Mixers

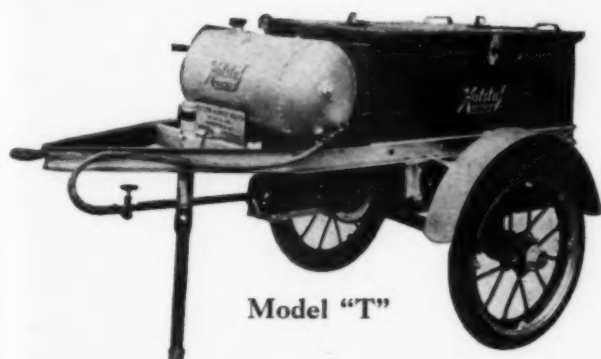


Model B—45 Degree Heat Distributor
Applied to Non-Tilting Mixer

All Hotstuf Universal Oil Burning Concrete Heaters have the patented removable coil and non-clogging vaporizing tip features, and will give a flame tempera-

ture of from 1800 to 2000 degrees F. The burner is detachable and can be used as a heating or thawing torch. Made in two convenient sizes.

GET OUR NEW BULLETIN NO. 15 SHOWING COMPLETE LINE OF WINTER EQUIPMENT

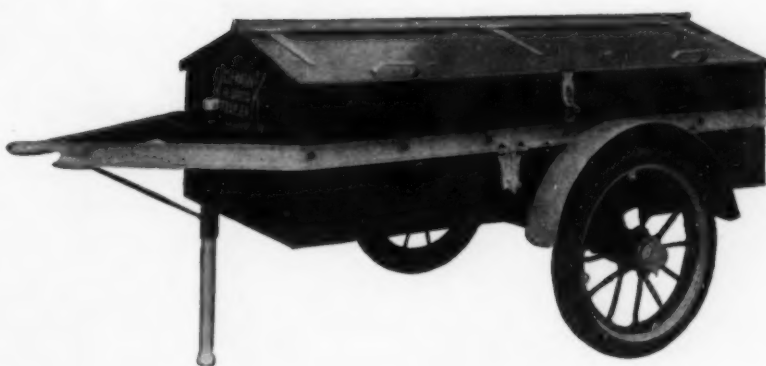


Model "T"

Above — "HOTSTUF" Asphalt Heater, with the patented elevated melting chamber is sold on its greater melting capacity rather than storage capacity.

Made in capacities best suited for the Highway Contractor, City, County and State Highway Departments. Equipped with the MOHAWK torch having the patented removable coil feature.

Below—MOHAWK HI-SPEED TRAILER TOOL BOX. No more loss of tools by theft. Take them to the job, keep them there till the job is finished. Lock them up at night in a MOHAWK HI-SPEED TRAILER TOOL BOX, which is designed to fit the requirements of the up-to-date road contractor.



MOHAWK ASPHALT HEATER COMPANY

Schenectady Distributors in Principal Cities New York

WIARD Revolving Automatic Scraper

ONE Tool for THREE Jobs

1. Excavates

2. Scrapes

3. Grades



Wiard Scraper

Furrow Plows

Rooter Plows

Grade Ripper

one man operation make this the fastest working machine of its size known. Handles wet soil and sticky clay cleanly and quickly. Digs in on hard ground. No extra men needed.

Write for bulletin that gives full data on Wiard contractor's equipment. (Distributors wanted for open territory).

See at Road Show, Booth 642, Exhibition Hall

WIARD PLOW COMPANY

BATAVIA, N. Y.



Prevent Concrete Failures by Making Tests of Your Concrete and Concrete Aggregates

Frequent compression tests are not only now required on all large contracts, but are absolutely essential from a standpoint of safety.

The illustration shows one of our 100-ton hydraulic presses arranged especially to test concrete test cubes, cement, stone, etc.

When it is desired to check and calibrate the gauge load readings, a variable pressure accumulator (of known increments) is furnished.

Write for Bulletin B-18X

THE WATSON-STILLMAN CO.

1014 Evening Post Bldg., New York City

Chicago
Cleveland

Pittsburgh
St. Louis

Philadelphia
Detroit

ATLAS DOUBLE-DUTY MACHINE

Does Work of Grader and Scraper in One Operation

Be low bidder and make larger profits

THE patented Grader-Scraper is a double-duty machine. At little more cost than a scraper, it accomplishes the work of two machines—a grader and a scraper—by application of the plow.

PLOWS BREAK SOIL—Plows control the cut and aid the Grader-Scraper to work efficiently in difficult soils, so a scarifier is seldom needed.

A PROFIT-MAKER—The Grader-Scraper grades, scrapes, fills and moves dirt at a low cost heretofore considered impossible.

Send for Bulletin No. 8, illustrating the Grader-Scraper, giving capacity, specifications and showing character of work it does.

Bulletin No. 9 tells why the Atlas Rotary Wheel Scraper moves dirt at exceedingly low yardage cost.

ATLAS GRADER-SCRAPER COMPANY

6207 Maywood Ave., Bell, California

BIGGS OFFERS COMPLETE STEEL PIPE SERVICE

The illustration shows 15,189 feet of Biggs Steel Pipe being installed for the Board of Water Supply, New York City.

Biggs' interest only starts when the contractor buy a definite amount of steel pipe, welded or riveted, to meet definite specifications. Biggs also furnishes every kind of data, assistance, and personal supervision necessary for accurate, speedy, and profitable installation.

More than that, Biggs stands ready to assume complete responsibility to you for actually laying your pipe. And, because the Biggs organization has at instant beck a 42 years' experience with all the problems incidental to steel pipe, you will find

"Built by Biggs"

Welded Steel Pipe	Air Locks
Riveted Steel Pipe	Welded Tanks
Pontoons	Riveted Tanks
Caissons	Steel Plate Construction of Every Description
Tunnel Shields	

that you can depend on Biggs' service "down to the last ditch."

Biggs Welded Steel Pipe has given complete satisfaction on 14 major municipal projects. The "Biggs weld" has been demonstrated by countless tests to be "stronger than the plate itself." Let us send you the Biggs story in pictures, "Unusual Steel Plate Construction."

THE BIGGS BOILER WORKS COMPANY

Kent Street and Case Avenue, Akron, Ohio

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Detroit

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A Valuable Time Saving Handbook Standard Construction Methods

By G. UNDERWOOD, Construction Engineer
408 pages, 6x9, 327 illustrations, Flexible Keratol,
\$5.00 postpaid.



*Complete in
one volume.*

*Modern building
construction
from A to Z*

A MANUAL of actual construction methods; methods that are used every day by practical construction superintendents and others upon whom rests the responsibility of getting things done. From first steps in organizing and preparing equipment, to pipework and painting; from pile driving to scaffolding, this new book covers everything in satisfying detail.

Everything in this book is practical, workable, and has been demonstrated over and over again in the field. It is a book no construction man will want to be without.

Contents:

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| I.—Organization and Equipment; | VIII.—Roofing and Flashing; |
| II.—Excavation; | IX.—Lathing and Plastering; |
| III.—Pile Driving; | X.—Scaffolds; |
| IV.—Concrete Construction; | XI.—Erection and Rigging; |
| V.—Wood Construction; | XII.—Pipework; |
| VI.—Brick Construction; | XIII.—Painting; |
| VII.—Steel Construction; | XIV.—Construction Schedules. |

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You may send me on 10 days' approval Underwood's STANDARD CONSTRUCTION METHODS, \$5.00 net, postpaid. I agree to remit for the book or return it postpaid within ten days of receipt.

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A Sensational Performer and Money Saver

THE speed, versatility, rugged construction, big yardage and low cost of the Fundom combination shovel, ditcher and crane, make it a sensational performer and money saver.

It makes small jobs profitable. Fast, full $\frac{3}{4}$ circle swing, $\frac{1}{3}$ yard dipper capacity, $16\frac{1}{2}$ foot radius, gasoline power.

With Trench Hoe attachment for ditching or Boom Extension for clamshell, dragline or crane, the Fundom is an unbeatable three-in-one digging machine.

Get the details and name of nearest dealer. Address—

The Fundom Hoist & Shovel Co.
314 Central Building, Lima, Ohio

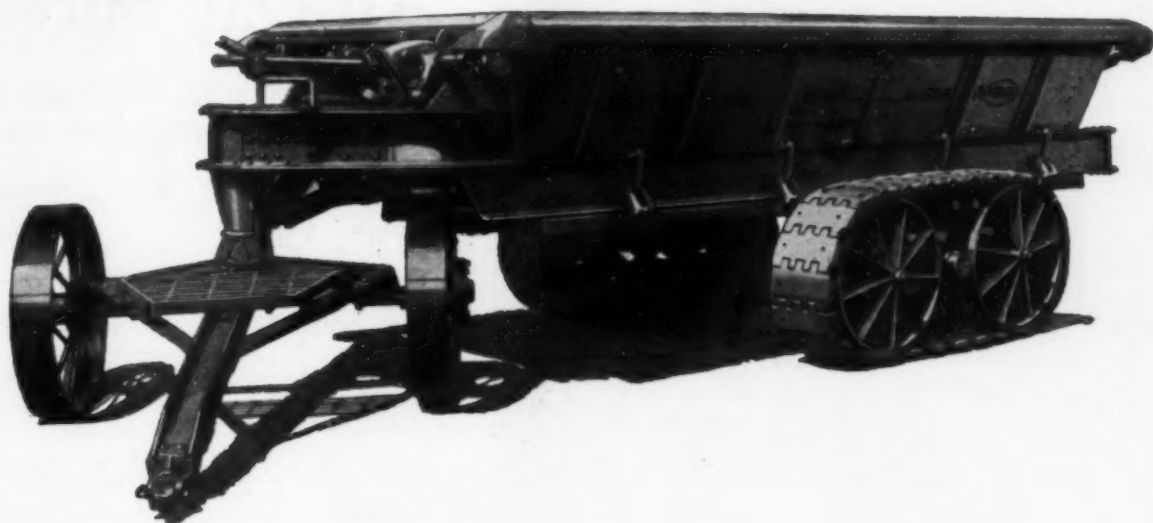


BULL FROG WHEELBARROWS

Here is Bull Frog No. 42—a general utility wheelbarrow much favored by contractors because it enables the handling of maximum loads with minimum effort. Like all Bull Frog barrows, carts and scrapers, it embodies exclusive advantages. Write for the catalog that explains what these are.

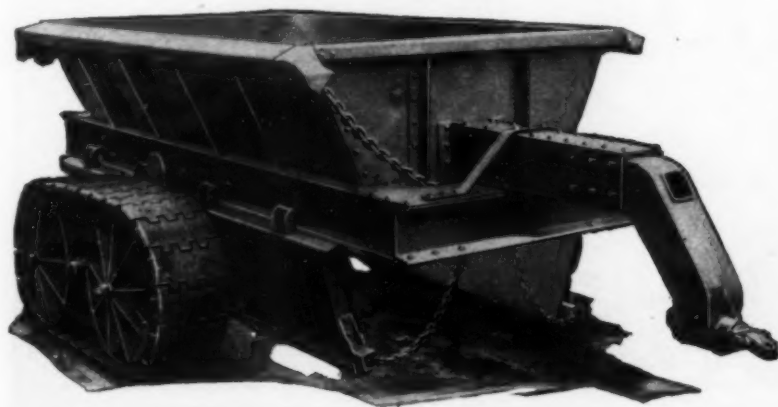
THE TOLEDO WHEELBARROW CO.
TOLEDO, OHIO

Branch Office and Warehouse
Chicago: 69 E. Wacker Drive



Western Crawler Dump Wagons With Front Truck or Direct Tractor Hitch

THIS is your year and Western Crawler Dump Wagons are ready to help make it the biggest and most profitable year you ever had.



Whatever the haulage or power conditions on your job, there is a Western Crawler Dump Wagon that will lengthen your day and your season, cut your costs and increase your profits. Tractor-hitch or with front truck—5 yard or 7 yard capacity; 10 yard for shovel loading—we build them all.

Western Crawler Dump Wagons fit all conditions and carry enormous loads wherever and whenever a Crawler tractor can operate.

Where shall we send our new Crawler Wagon Bulletin 29-QD?

Western Wheeled Scraper Company
Aurora, Illinois, U. S. A.

WESTERN

DUMP CARS AND GRADING EQUIPMENT



All Day Suckers

In the distance you can see a Moretrench Combination Pump.

The long pipe is a Moretrench Header Pipe.

The vertical pieces are Moretrench Wellpoints.

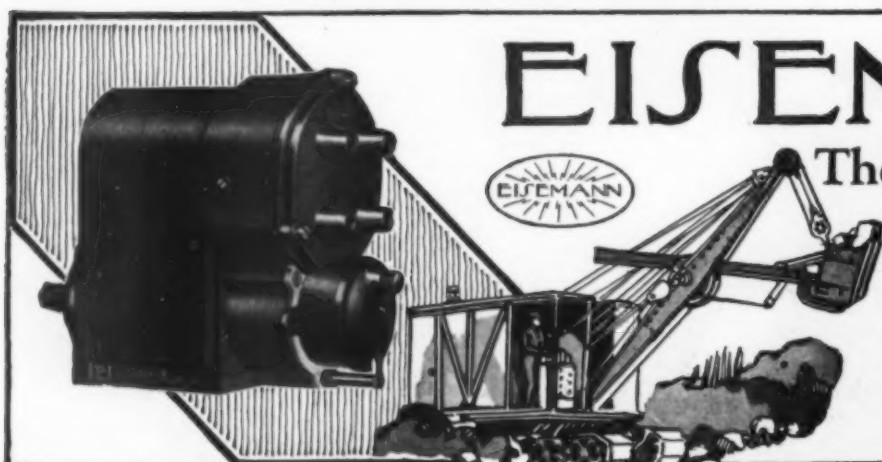
The whole is a complete Moretrench Wellpoint System.

The job is one of eight New York Subways bone-dried by this new method of handling water. And don't forget that the best is the cheapest on any job, large or small.

*Outside and Inside Exhibits
at the Road Show*

Moore Trench Machine Co.

Rockaway, New Jersey



EISEMANN

The Foremost Magneto

for Construction Equipment

The overwhelming choice of the builders of high quality equipment. Favored by contractors everywhere.

EISEMANN MAGNETO CORPORATION
165 Broadway - New York

EASILY PULLS GEARS and WHEELS

To
Crane
Puller Co.,
Waltham, Mass.

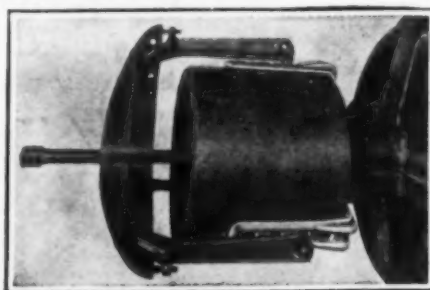
Gentlemen:
Show me how gears
and wheels can be pulled
easily. Quote prices on
Crane Pullers. No obligation.

From
Address

In removing wide faced pulleys, silent chain drive sprockets, paper faced pulleys, etc., a longer arm with a deep wide jaw is required. This attachment is used as an extension to the regular arm. It does especially fine work in removing paper faced pulleys. It is shown (on the right) removing a 20-in. by 24-in. Paper pulley from a 200 H.P. Motor.

Truck wheels, winch drums, pulleys, gears, etc., are quickly pulled with this handy tool.

You can not stick it on the toughest job! Every power shovel, dump-truck, hoisting engine,—every paving mixer should be equipped with a Crane puller in its tool box!

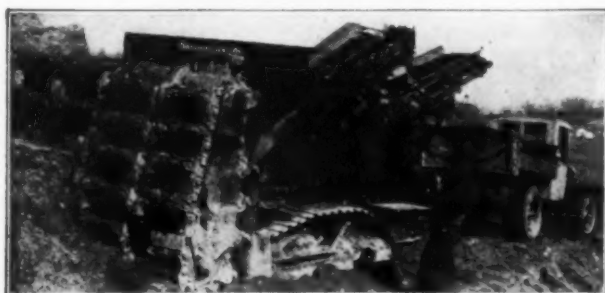


CRANE PULLER CO.
Waltham, Mass.

Start Cutting Next Summer's Pay Roll at Booth 220



B-G Portable "N" Conveyor and B-G Self-feeding Bucket Loader cutting aggregate handling costs on concrete road job



Loading 2½ yd. trucks in 30 to 50 seconds on cut and fill work with the new B-G Excavator



The B-G Vertical Boom digs straight down on both sides of pipe lines already laid

You may be able to chop thousands of dollars off next summer's costs—at the Road Show.

Barber-Greene are saving that amount of money every year for contractors and highway departments.

And the Road Show is an excellent time to see what they can do for you.

Examine the many exclusive advantages of Barber-Greene Self-feeding Bucket Loaders—Vertical Boom Ditchers—Excavators—and Belt Conveyors.

Have the mechanical features demonstrated. See the moving pictures showing these machines handling the kind of jobs you'll be doing next summer.

We can promise you some new and interesting ideas to help cut your 1930 costs.

BARBER-GREENE COMPANY, 530 W. Park Avenue, Aurora, Illinois

BARBER



GREENE

FLORY

ANNOUNCING the New "FLOR-OX" 15-25 CONTRACTORS' HOIST

Look for it at the
Road Show
Booth No. 520

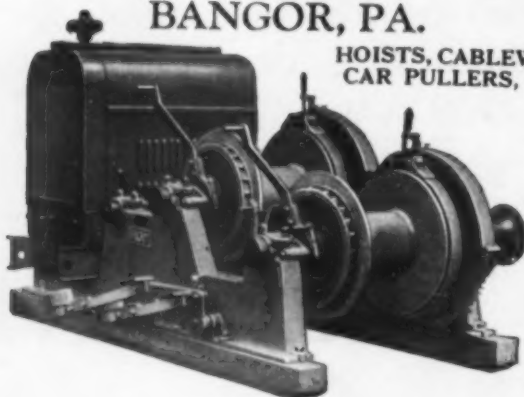
This NEW "FLOR-OX" is marked by smoothness of operation, utmost dependability and extreme ruggedness of construction. It has the same outstanding features as the "FLOR-OX" 35-50 described below.

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ROLLER BEARING THRUSTS FOR FRICTION CLUTCHES
LESS WEIGHT AND SPACE WITH GREATER EFFICIENCY
POSITIVE RELEASE DEVICE ON FRICTION LEVERS
ALEMITE LUBRICATION
THE "35" HAS A ROPE PULL OF 5000 POUNDS AT 165 FEET PER MINUTE
THE "50" HAS A ROPE PULL OF 7000 POUNDS AT 165 FEET PER MINUTE
EXTRA HEAVY SHAFTS AND BEARINGS
SILENT CHAIN DRIVE ENCLOSED IN DUST PROOF CASING
MACHINE CUT TEETH ON ALL MAIN GEARS AND PINIONS

S. FLORY MFG. CO.
BANGOR, PA.

HOISTS, CABLEWAYS,
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Dobbie Line

Oil Reservoir Sheaves for Long Life,
High Speed and Heavy Duty—Cast
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Write for Catalog
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Derricks, Steel and Wood,
Stiff Leg and Guy.

Derrick Fittings, Ball and
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Hand Winches.



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Complete Stock Carried at Niagara Falls—
Also G. S. Green Co., 74 Warren Street,
New York City, N. Y.

THOMAS HOISTS

are preeminent in Construction.

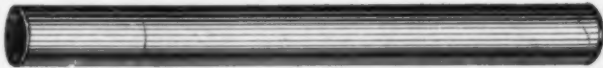
Built in all sizes to do all hoisting jobs
faster and more dependably. Regularly
furnished with BAND FRICTIONS and
AUTOMATIC BRAKES.

Send for Catalog

THOMAS ELEVATOR
COMPANY CHICAGO
20 SOUTH ROYNE AVENUE.



Just the Thing for Plans and Blue Prints



Every one can use Cleveland Blue Print Containers to protect their plans and blue prints from snow, rain, dirt and handling.

Substantially made, they come in many sizes to fit your needs—3-in. x 30-in., 36-in. and 42-in.—2-in. x 30-in., 36-in. and 42-in. Special sizes on order.

SAVE BOLTS with CLEVELAND
Cleveland Bolt Sleeves save time,
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OTHER PRODUCTS

Cleveland Dowel Sleeves are best for concrete road construction. Cleveland Test Containers (sizes 6 in. x 12 in. and 8 in. x 16 in.) are standard for test work. Cleveland paper tubes in sizes 1/4 in. to 10 1/4 in. are ideal for casting holes of all sizes in form work, casting railing and conduit holes, casting culvert holes, etc. Tubes are capped or uncapped, made in diameter and lengths to your specifications.



The Cleveland Container Co.
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*Manufacturers of Paper Tube Products
for the Construction Industry.*

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Gasoline—Electric—Steam

Built up to a standard
Not down to a price.

Car Pullers—Cableways

J. S. Mundy Hoisting Engine Co.

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Protected Hands Do MORE Work

A good pair of gloves makes a lot of difference.

Bare hands don't take hold as eagerly as those protected with a pair of good gloves like Sabin's. There's real protection in Sabin's—they're "rough and tough"—keep hands warm on the coldest day.

Tell your men about them—they can benefit by a special lot price if they order together.

They'll help your men do more work—and they'll thank you for having put them "hep" to a good glove.

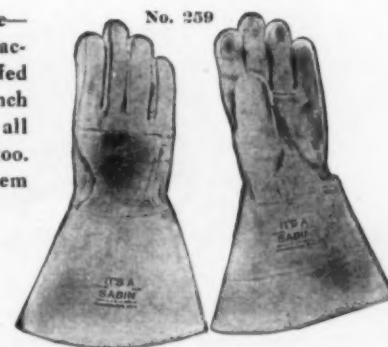
Use the coupon

Sabin Co., Gloves
536-40 W. Federal St.,
Youngstown, Ohio

Here's the ideal winter glove—No. 259. It's warm and practically has no wear out. Buffed Elk hand and back, six inch canvas cuff, outseam and all seams protected—washable, too. Hold tight back keeps them from slipping off.

Regularly \$1.60, but there's a special price for quantity order.

Send the coupon.



COUPON

SABIN CO., Gloves. 536-40 W. Federal St., Youngstown, Ohio

Send information and prices on pairs of No. 259. Send a pair of No. 259 \$1.60 enclosed.

Name

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City..... State.....

OK HOISTS

.... SOLVE
THE MATERIALS HOISTING
PROBLEM .. CHEAPLY .. QUICKLY

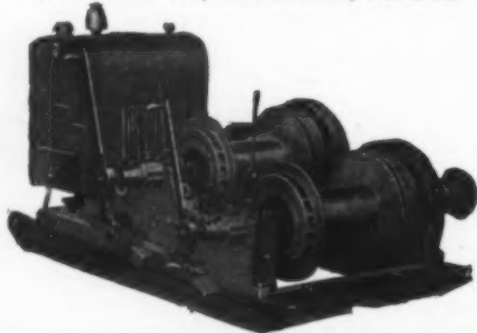
The O.K. Portable Hoist pays its way day after day, year after year because it does so many jobs well—loading and unloading materials; hoisting supplies; operating scrapers and drags; running portable elevators.

Here are the reasons why so many O.K.'s are in constant use: Heavy engines, powerful brakes and asbestos lined double friction clutches!

O. K. Air Compressors
O. K. Portable Elevators

We have a profitable proposition for live-wire agents.

O.K. Clutch and Machinery Co.
P. O. BOX 305, COLUMBIA, PENNA.



Buhl

AIR COMPRESSORS

"YEARS AHEAD"

**WILL BE
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**AT THE
ROAD SHOW**

ATLANTIC CITY

Jan. 11-18, 1930

Booths 453 & 469

The BUHL Company—Gen. Offices: Chicago



HUMDINGER PUMPS

Non-clogging, everlasting rubber ball valves, totally enclosed, running-in-oil jacks, bronze bushed bearings, all steel trucks, and enclosed engine crank cases make HUMDINGER PUMPS.

THE CONTRACTOR'S CHOICE

Full detail description given in Bulletin No. 1034 CM. Send for a copy.

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Factory: Hackensack, N. J.

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TAPES—RULES

Hard Enamel Finish, Brass Strike Plates, and Rust-Proof Spring Joints make these rules most serviceable. Bright Red Ends give them a very smart appearance.

THE LUFKIN RULE CO.

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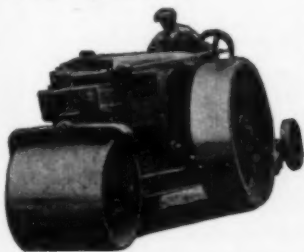
New York



Helping To Make Road-Building History

In the construction and maintenance of our roads and streets, Buffalo-Springfields are enacting a major role.

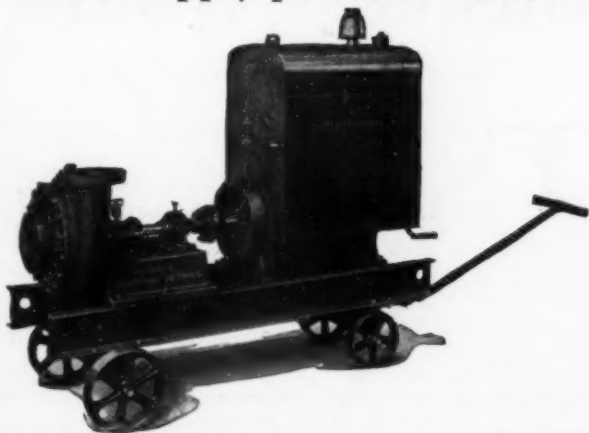
Sound engineering principles, resulting in unusual roller service, have won for this particular make of equipment an enviable place in the confidence and judgment of those who are making road-building history.



Both steam and motor-driven models in all practical sizes. Attachments when desired. Write for interesting booklet.

The
Buffalo Springfield
Roller Co.
Springfield, Ohio

To make your unwatering and water supply problems easier!



THIS Morris Portable All-Purpose Pump handles anything from clear water to floating dirt, sand and gravel, delivers 300 to 600 gals. per min., can be used for heads up to 50 ft., and is easy to cart from one job to another. For general water supply, unwatering excavations, sumps, etc., it can't be beat.

Write for literature about this and other sizes of Morris Pumps

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

MORRIS

CENTRIFUGAL PUMPS

Goodby Primers and Foot Valves!



Jaeger-Barnes SELF PRIMING Centrifugals are Always Ready to Pump

Get 3 times the capacity in one 100% automatic, continuous high vacuum pump. Sizes for any job... gasoline or electric. Puts other types out of date. Write for catalog and prices.



PLUNGER
PUMPS
—
DIAPHRAGM
PUMPS



TRIPLEX ROAD PUMPS



JAEGER MIXERS—PUMPS—HOISTS

Information Slip

THE JAEGER MACHINE CO., 800 Dublin Ave., Columbus, Ohio

Send catalog and prices on ☐ Pumps, ☐ Non-Tilt Mixers, ☐ Tilters, ☐ Timken Roller Hoists.

Name _____

Address _____



Showing Curcrete being applied on
Division Road, Royal Oak, Michigan

Successfully used in 28 states!

Three years ago conservatively tested in a few communities on a few thousand square feet of concrete—today, widely used in 28 states in the curing of 10 million square yards of concrete pavement.

This is the amazing story of Curcrete—the easy, new, positive way of curing concrete. No more obsolete methods. No more curing of concrete roads and streets with water, burlap, hay, earth or chemicals.

Curcrete is an asphalt emulsion—applied in the form of a fine spray to freshly finished concrete—while it is still soft and wet. The curcrete method stops evaporation of water from the concrete—immediately. It prevents checking and subsequent scaling. It insures maximum and uniform strength.

Curcrete costs little—one gallon covers 8 to 10 square yards. With our specially-designed sprayer and bridge, but one man is required to cure from 1000 to 1500 running feet of 20 ft. wide pavement per day.

Write today for booklet giving complete data about Curcrete.

THE BARBER ASPHALT COMPANY

New York Philadelphia Chicago
Pittsburgh St. Louis Kansas City San Francisco

"Curcrete" (trade-mark registered) is sold for use in the curing of concrete by the "Curcrete" method (U. S. Patents 1,539,763 and 1,684,671, and foreign patents pending) controlled by The Barber Asphalt Company. The Barber Asphalt Company grants to the purchasers of "Curcrete" the right and license to practice the "Curcrete" method of curing concrete, controlled by it, in connection with the use of "curcrete" produced by it, and the purchasers by accepting "Curcrete" accept the license and acknowledge the company's rights in connection with the "Curcrete" method.

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Protection against weather-damage at low cost. "FULTEX" Khaki Waterproofed tents, tarpaulins and windbreaks—serviceable for every purpose—quality at moderate price. Burlap—in bale or made-up covers—for protecting green concrete.

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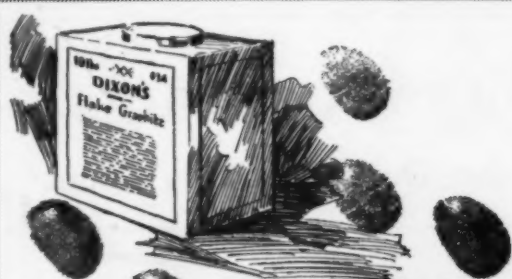
Business Wants

THE Searchlight Section of this paper represents a meeting place for men and concerns who have immediate business "wants" to fill—the section covers

Agencies Wanted
Agents Wanted
Books and Periodicals
Business Opportunities
Civil Service Opportunities
Contracts Wanted
Desk Room for Rent or Wanted
Educational
Employment Agencies
Employment Service
Foreign Business
For Exchange
For Rent
For Sale
Franchises
Labor Bureaus
Miscellaneous Wants

New Industries Wanted
Office Space for Rent or Wanted
Partners Wanted
Patent Attorneys
Patents for Sale
Plants for Sale
Positions Vacant
Positions Wanted
Property for Sale
Representatives Wanted
Salesmen Available
Salesmen Wanted
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Sub-Contracts Wanted
Tutoring
Vacation Work Wanted
Work Wanted

"SEARCHLIGHT"



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for more than 100 years

This is the identifying mark of Dixon's...Graphite. The combination, Dixon's and Graphite, have been synonymous all over the world for more than 100 years.

And, another word that is closely linked with these two is—lubrication. These three are inseparably linked in the minds of thousands of mechanics, maintenance men, and engineers, for unquestionably Dixon's Flake Graphite has its place in every well planned scheme of lubrication, and as an auxiliary lubricant with oils and greases it is generally recognized as benefiting the base lubricant.

If you have never had the how, where and why of Dixon's Flake Graphite lubrication explained to you, write for it today. Or, better still, send us an outline of your lubricating problems and we'll tell you how Dixon's can help you.

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Compliments
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Season



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Surveying Instruments and
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Jaeger Heavy Duty 10 S Holds 2 Bags

Built of Steel - ½
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50% stronger



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SHAKER**

Steps that man
from pounding
loader out of
shape.

Fast - Portable - Sturdy

**100%
BALL
BEARING**



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SPEED KING**

Skip Shaker loader, remixing drum action. Accurate Measure Water Tank and fast discharge (8 to 11 seconds) mean more thoro mixed concrete per day. Machined steel tracks, chilled ground faced rollers and ball bearings save power, save wear. Direct drive, one man control, dual tires for soft and hard ground. Get our new low prices, terms on tilters or non-tilters, 3½ to 28 ft. sizes. OK'd by over 75,000 users.

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A typical
WAPPAT Electric Handsaw job, finishing
a roof ten times quicker and much safer for
the man on the job. Write for trial at our
expense.

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INCORPORATED**

Division of
**SIMONDS SAW &
STEEL CO.**

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Pittsburgh, Pa.

Name

Address

City

Who's Getting the Big Contracts?

A Monthly Guide to Where the Construction Dollar is Being Spent

1—New England

Paper Mill, Bucksport, Me., to Morton C. Tuttle Co., Boston, \$10,000,000.

School, Providence, R. I., to Merritt-Chapman & Scott, and others, \$1,119,224.

Railroad Terminal, Boston, Mass., to Sawyer Constr. Co., \$500,000

2—Middle Atlantic

Water-works, Albany, N. Y., to J. J. Finn & Son, \$871,196.

Bridge foundations, New York, N. Y., to Arthur McMullen Co., \$706,800.

Apartment House, New York, N. Y., to Teeson Constr. Co., \$1,200,000.

Apartment House, New York, N. Y., to Todd & Brown, \$1,000,000.

Apartment House, New York, N. Y., to Teeson Constr. Co., \$2,500,000.

Office Building, New York, N. Y., to Caldwell-Wingate Co., \$5,000,000.

Stack House at Blast Furnace, Steel and Wire Mill, Donora, Pa., to American Bridge Co., Ambridge, \$1,000,000.

Boiler Plant, New York, N. Y., to Kerr Well Contg. Co., \$400,000.

Water-works, Erie, Pa., to Montrose Contg. Co., New York, \$530,000.

Sewers, East Paterson, N. J., to Kuchar Bros., Montvale, and others, \$343,885.

Subway, Brooklyn, N. Y., Sect. 3, R. 110, to Carleton Co., Inc., N. Y. C., \$4,781,875.

Apartment House, New York, N. Y., Tishman Realty Co., separate contracts, \$1,300,000.

City Hall, Bayonne, N. J., to Hugh Montague & Sons, Jersey City, \$1,508,000.

Auditorium, Pittsburgh, Pa., to Hughes Foulkrod Co., \$1,000,000.

Glass Factory, Corning, N. Y., to H. K. Ferguson Co., Cleveland, \$600,000.

Sewers, Westfield, N. J., to J. Miele, East Orange, \$546,954.

State Highways, Pennsylvania, to Lane Constr. Corp., Meriden, Conn., and others, \$579,978.

Apartment building, New York, N. Y., to J. Gilbert, \$2,500,000.

Union League Club, New York, N. Y., to Hegeman-Harris Co., \$1,000,000.

Engineering Laboratory, East Pittsburgh, Pa., to Mellon Stuart Co., Pittsburgh, \$300,000.

State Highways, Pennsylvania, to E. Riley Mixner Co. & Persaggi Bros., Ocean City, N. J., and others, \$1,319,710.

Rearranging Railroad Tracks, N. Y. C. R. R. Co., New York, N. Y., to Arthur McMullen Co., \$500,000.

Apartment, Baltimore, Md., Investment Constr. Co., separate contracts, \$1,000,000.

Hospital, Johns Hopkins, Baltimore, Md., to Consolidated Eng. Co., \$1,000,000.

School, Cincinnati, O., to David Gordon Constr. Co., \$1,207,213.

Auditorium, Pittsburgh, Pa., to Geo. A. Fuller Co., Washington, D. C., \$1,000,000.

Apartment House, Chicago, Ill., to W. G. McNulty & Bros., \$1,000,000.

Sewers, Detroit, Mich., to Lemane & McIlvenna, \$475,000.

Sewers, Toledo, O., to A. Bentley & Sons, \$1,113,000.

Viaduct over Chicago River, Chicago, Ill., to Underground Constr. Co., \$391,550.

Bridge, Passaic, N. J., to F. W. Schivers, Jr., New York, N. Y., \$433,666.

State Highways, Michigan, to Hersey Gravel Co., Hersey, and J. H. Baker & Sons, Port Huron, \$555,335.

State Highways, Ohio, to W. I. Anderson, Dayton, and others, \$327,232.

Hospital, Excelsior Springs, Mo., to Munch Bros. Constr. Co., St. Louis, \$474,000.

Warehouse, Cold Storage, Oklahoma City, Okla., John J. Harder, Inc., company forces, \$350,000.

State Highways, Iowa, to Harrison Eng. Co., Kansas City, Mo., and others, \$1,265,362.

Office, St. Louis, Mo., to Humes-Deal Co., \$3,000,000.

Grading, Montana State Highways, to Morrison Kundsén Co., Spokane, Wash., and others, \$444,568.

State Highways, Nebraska, to Diamond Eng. Co., Grand Island, and others, \$450,427.

Irrigation, 60,000 acres, Eagle Pass, Tex., to Ulen & Co., New York, \$4,000,000.

Gasoline Cracking Chambers, Port Arthur, Tex., to A. O. Smith Co., Milwaukee, \$1,000,000.

Apartment Building, Oklahoma City, Okla., to Holmboe Constr. Co., \$1,500,000.

Power Plant, Oklahoma City, Okla., to Byllesby Eng. Co., Chicago, \$1,000,000.

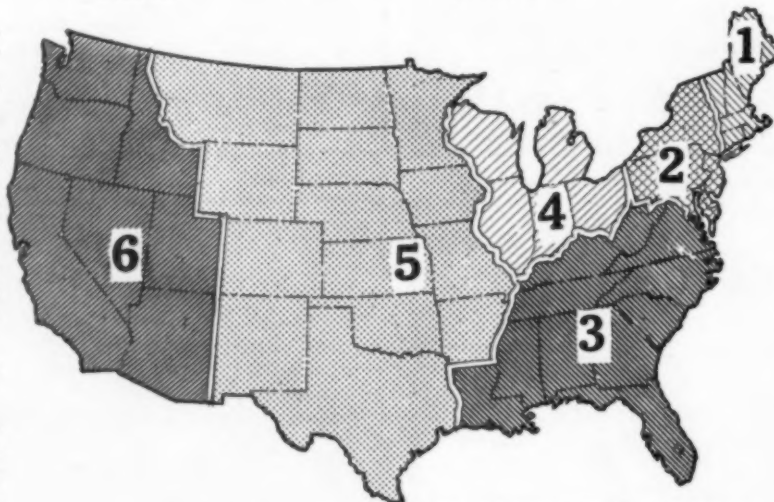
Power Plant, Paris, Tex., Fairbanks, Morse & Co., Chicago, \$400,000.

State Highways, Iowa, to C. F. Lytle Constr. Co., Sioux City, and others, \$1,274,776.

State Highways, Louisiana, to Couch Constr. Co., Dothen, Ala., and others, \$1,626,209.

Dikes, Boles, Mo., to Massman Constr. Co., Kansas City, \$401,988.

Grain Elevator, Minneapolis, Minn., to Peppard & Fulton, \$600,000.



3—South

Court House, Tampa, Fla., Treasury Dept., to J. L. Crouse, Greensboro, N. C., \$333,700.

Foundry, Franklin, Tenn., to S. M. Hodges Co., Atlanta, Ga., and Nashville Bridge Co., Nashville, \$200,000.

State Highways, Louisiana, to Davis Constr. Co., Atlanta, Ga., and others, \$806,619.

Store, Memphis, Tenn., to E. J. Pearson, \$300,000.

State Highways, Ohio, to Highway Constr. Co., Cleveland, \$1,025,988.

Substation, Detroit, Mich., Detroit Edison Co., separate contracts, \$375,000.

5—West of Mississippi

Bridges, Missouri State Highway, M. E. Gillioz, Monett, and others, \$408,679.

State Highways, Arkansas, to Hartman-Clark Bros. Co., Peoria, Ill., and others, \$497,381.

State Highways, Iowa, to Henkle Constr. Co., Mason City, and others, \$1,651,960.

State Highways, Missouri, to Gaines Bros. Co., Fairland, Okla., and others, \$1,315,914.

State Highways, Texas, to Cocke & Braden, Marshall, and others, \$996,724.

4—Middle West

Rebuilding Railroad Yards, C. B. & Q., company forces, \$4,000,000

Warehouse, Moline, Ill., to J. H. Hunzinger & Co., Davenport, Ia., \$300,000.

6—Far West

Bridge, Washington State Highway, to Pacific Bridge Co., San Francisco, \$502,274.

Bridge, King County, Wash., to Puget Sound Bridge & Dredging Co., Seattle, \$482,181.

Cold Storage Terminal, San Pedro, Calif., to R. Brown, \$1,250,000.

Sewers, Los Angeles, Calif., to J. Artukovich, \$323,275.

College Group, Santa Monica, Calif., to J. Brennan, Los Angeles, \$1,000,000.

Apartment Building, Los Angeles, Calif., to H. Horowitz, \$350,000.

SEARCHLIGHT SECTION

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C.M.

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Address copy to the Searchlight Department
Construction Methods
Tenth Ave. at 36th St., New York City

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SUPERINTENDENTS of construction, engaged entirely in heavy construction work, experienced in hydro-electric construction, concrete and earth dams, power houses, rock excavations, etc. If you are open for a position of this description, advertise in the Searchlight Section of Construction Methods. Send your ad to the Searchlight Dept., Tenth Ave. at 36th St., New York.

POSITIONS WANTED

CONSTRUCTION superintendent, with 14 years' experience on commercial building and heavy constructions, desires to make change. Also 2 years' experience on river bridges and power plants. First-class concrete engineer. References. PW-94, Construction Methods, Tenth Ave. at 36th St., New York.

WANTED: If you are in need of Construction Engineers, experienced in superintending, estimating, drafting and purchasing, you should place your need before the live wire readers of Construction Methods. Send your ad today to Searchlight Dept., Construction Methods, Tenth Ave. at 36th St., New York.

CONSTRUCTION superintendents, experienced in concrete arch bridges, difficult foundations, river work, heavy shoring, cofferdams, pile driving, sewage treatment, water purification plants, etc., can readily be obtained through an advertisement in the Searchlight Section of Construction Methods. Send your ad today to Searchlight Dept., Construction Methods, Tenth Ave. at 36th St., New York.

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G-9

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31 South Clarke St.

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ODEE Pipe for gas lines—factory-welded into double lengths, to cut field welding. Plain end and threaded pipe, with or without couplings. Casing in all sizes. All ready for immediate shipment from strategic centers.

Jos. GREENSPON'S Sons
IRON & STEEL CO.

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BORGER, TEX.

WHEATLAND, PA.

PIPE FOR ALL PURPOSES.

"Opportunity" Advertising:

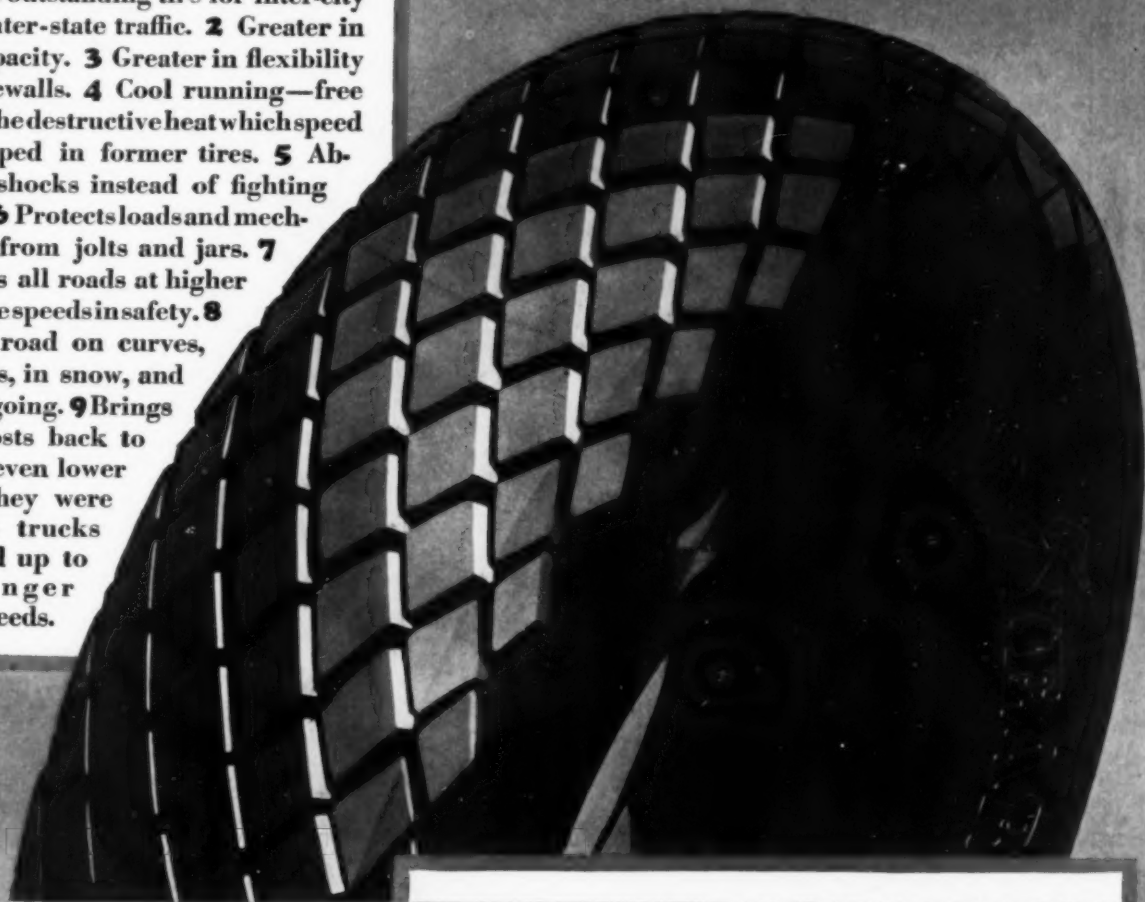
Think "SEARCHLIGHT" First!

ALPHABETICAL INDEX TO ADVERTISERS

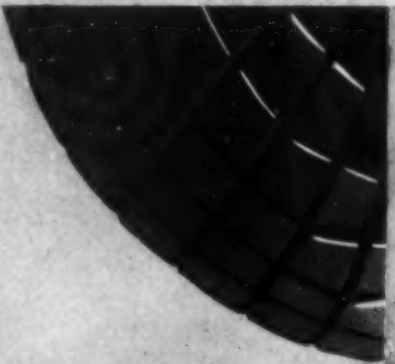
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[illegible]

1 The outstanding tire for inter-city and inter-state traffic. **2** Greater in air capacity. **3** Greater in flexibility of sidewalls. **4** Cool running—free from the destructive heat which speed developed in former tires. **5** Absorbs shocks instead of fighting them. **6** Protects loads and mechanism from jolts and jars. **7** Travels all roads at higher average speeds in safety. **8** Holds road on curves, on hills, in snow, and in soft going. **9** Brings tire costs back to levels even lower than they were before trucks stepped up to passenger car speeds.



Balloon Tires *Goodyear's* *newest development for* Trucks



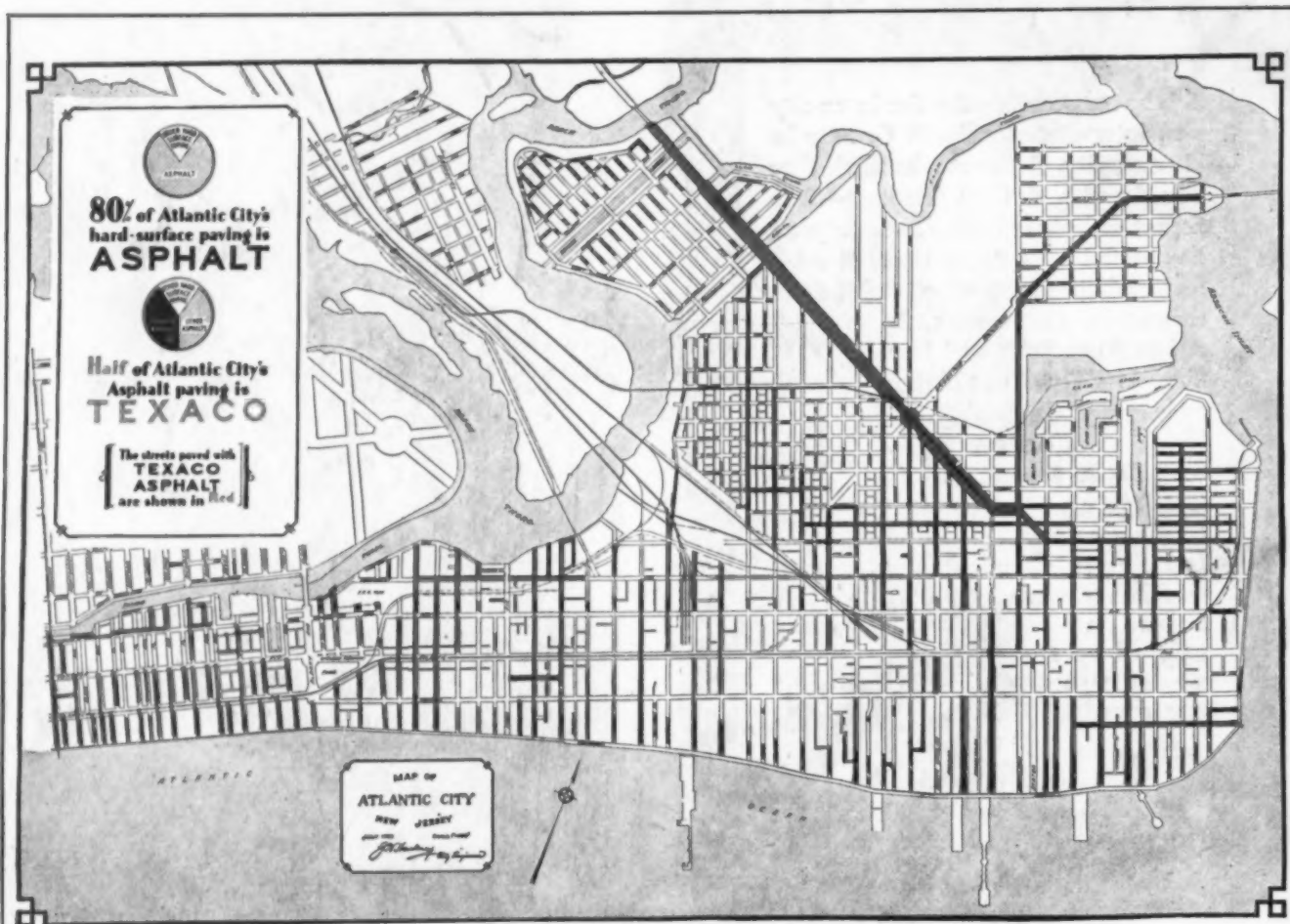
YOU know what balloon tires have done for passenger cars. Here they are now for trucks—pioneered by Goodyear.

Put them on your trucks — and end the tire troubles due to high speed, long distance operation.

Let your local Goodyear Truck Tire Service Station Dealer show you how easily the change-over can be made on your present trucks. Specify them on new trucks—manufacturers are rapidly adopting them as optional original equipment.

GOOD YEAR

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Naturally, Road Builders are asking:

"HOW IS ATLANTIC CITY PAVED?"



Morris Avenue, Atlantic City, N. J., with its resilient, durable TEXACO Asphalt pavement.

Like other leading American cities, Atlantic City, N. J., has more Asphalt paving than all other hard-surface paving combined.

But the more significant fact is that half of the Asphalt paving in the World's Playground is TEXACO Asphalt.

Atlantic City is one of 37 important cities in the United States and Canada, the TEXACO Asphalt paving in each of which exceeds half-a-million square yards.

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